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ABSTRACT

The major findings of a research project on the relationship between population growth and economic development are summarized in this monograph. The study compares recent demographic and economic trends in Japan, Korea, Thailand, and Indonesia to worldwide experience as described by an econometric model of population and development. The study presents evidence that, by reducing their rates of childbearing, the four countries studied have been able to achieve higher material standards of living. Fertility reduction is shown to result in greater expenditures on education, leading to a more productive labor force, higher rates of saving and investment, and populations with greater numbers of people of working age. Contrary to common belief, additional population growth generated by reduced mortality does not appear to reduce standards of living or lower rates of growth of per capita income appreciably. Other issues addressed include: (1) the extent to which declining fertility is an automatic feature of economic development, as opposed to a consequence of population policy and other non-development factors; (2) the importance of investment in population quality as a means of achieving higher rates of economic growth; and (3) the reasons for high life expectancies among East Asian populations. Twenty-four tables and 17 figures present the findings graphically. A 114-item bibliography is included. (JB)

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Number 10

POPULATION GROWTH AND ECONOMIC DEVELOPMENT: LESSONS FROM SELECTED ASIAN COUNTRIES

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Andrew Mason
Daniel B. Suits
Sung-Yeal Koo
Naohiro Ogawa
Mathana Phananiramai
Hananto Sigit

United Nations Fund for Population Activities

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FOREWORD

Most interest in the linkages between population and development has focused on countries with slow rates of economic growth, high rates of population growth, and unsuccessful family planning efforts. The study presented in this volume departs from tradition by examining the population-development relationship in countries notable for their success in reducing fertility.

Korea, Japan, Indonesia, and Thailand are distinct in their cultures, their traditions, and their levels of development, but they share success. Each country has enjoyed rapid economic growth and experienced rapid fertility decline during the last two decades. In this context, several questions arise. How are these phenomena connected? Does socioeconomic development lead to accelerated fertility decline? Have fertility decline and slower population growth been supportive of rapid socioeconomic development? Or have the economies of these countries proceeded apace independently of demographic trends?

The answers to these questions are central to the population debate. It is hoped that publication of this report will provide new insights and raise new issues for scholars in the field.

Rafael M. Salas
Executive Director
United Nations Fund for
Population Activities

New York
October 1986

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PREFACE

This monograph summarizes the major findings of a recently completed research project on the relationship between population growth and economic development carried out as a joint effort of the East-West Population Institute, East-West Center, Honolulu, Hawaii, the Nihon University Population Research Institute, Tokyo, Japan, and the United Nations Fund for Population Activities. The study compares recent demographic and economic trends in four Asian countries to worldwide experience as described by an econometric model of population and development. The experiences of Japan, Korea, Thailand, and Indonesia are relevant because each country has enjoyed remarkable success in achieving a high rate of economic growth and in reducing rates of childbearing and population growth.

The study deals with issues central to current research and policy formulation in the area of population and development. It presents evidence that, by reducing their rates of childbearing, the four countries studied have been able to achieve higher material standards of living. Fertility reduction is shown to result in greater expenditures on education, leading to a more productive labour force, higher rates of saving and investment, and populations with greater numbers of people of working age. Contrary to common belief, however, additional population growth generated by reduced mortality does not appear to reduce standards of living or lower rates of growth of per capita income appreciably. Other issues addressed include: the extent to which declining fertility is an automatic feature of economic development, as opposed to a consequence of population policy and other non-development factors; the importance of investment in population quality as a means of achieving higher rates of economic growth; and the reasons for high life expectancies among East Asian populations. These findings should prove useful to students and to policy-makers interested in underlying interactions between population and the economy of their own countries and in appreciating the value and economic consequences of population policy.

During the life of the project several meetings were held to which outside experts were invited and from whom valuable advice was obtained. Of critical importance were the reactions and suggestions of those who are intimately knowledgeable about policy formulation and implementation in their respective countries and who agreed to provide their input throughout the project: Dr. Bon Ho Koo, then Vice-President and Population Secretariat, Korea Development Institute; Dr. Adrianus Mooy, Deputy Chairman, BAPPENAS (Indonesia); Dr. Duck-Woo Nam, former Prime Mininster, Korea; and Khun Vira Osathananda, then Deputy Secretary General, National Economic and Social Development Board, Thailand.

We are grateful to a number of institutions that provided important support to this project, including the Korea Development Institute, the Central Bureau of Statistics of Indonesia, and the National Statistical Office of Thailand.

A number of professional colleagues provided important substantive input, including Hirofumi Ando, Gavin Jones, Linda Martin, Nipon Poapongsakorn, Kong-Kyun Rho, Wi-Sup Song, and J. Supranto and A. Thavarajah. The efforts of Gayle Uechi and of other technical and administrative staff members at EWPI and NUPRI are gratefully acknowledged. Research assistance by Yu-lin Chang, Nimfa Mendoza, and Sung-Chul Chung and secretarial support by Norma Uejo and Loretta Koga were of high quality and greatly appreciated.

Finally, we would like to acknowledge the leadership provided by Dr. Toshio Kuroda and the active support of the Nihon Population Research Institute and the United Nations Fund for Population Activities.

Lee-Jay Cho
Director
East-West Population
Institute
East-West Center
Honolulu, Hawaii

Honolulu, Hawaii
August, 1986

LIST OF CONTRIBUTORS

Andrew Mason, Assistant Director for Professional Education, East-West Population Institute, East-West Center, and Professor, Department of Economics, University of Hawaii, Honolulu, Hawaii, U.S.A.

Daniel B. Suits, Professor, Department of Economics, Michigan State University, East Lansing, Michigan, and Research Fellow, East-West Population Institute, East-West Center, Honolulu, Hawaii, U.S.A.

Sung-Yeal Koo, Associate Professor, Department of Economics, Yonsei University, and Assistant Secretary, The Korean Economic Association, Seoul, Korea.

Naohiro Ogawa, Deputy Director, Population Research Institute and Professor, College of Economics, Nihon University, Tokyo, Japan.

Mathana Phananiramai, Assistant Professor, Faculty of Economics, Thammasat University, Bangkok, Thailand.

Hananto Sigit, Director, Bureau of Analysis and Development, Central Bureau of Statistics, Jakarta, Indonesia.

INTRODUCTION

We all emulate success, if only we can understand how it is achieved. Thus, parents wonder why their friends' children all graduate from first-rate universities; the business man studies IBM and Mitsubishi; economists the world over study Japan; and population experts study Korea, Taiwan, Sri Lanka and other countries experiencing notable success in bringing their population growth rates under control. This work follows in that tradition. It studies the relationship of population to economic development by examining the experience of four Asian countries: Indonesia, Japan, Korea and Thailand.

Each of these countries has experienced its own successes. The success of some has been more notable than of others, but each country has managed substantial progress in reducing rates of population growth and raising rates of economic growth. Japan's economic success is widely recognized. Although its economy had recovered from the devastation of World War II by 1960, total output was still considerably below that of France, Germany, and the United Kingdom, and was only one tenth that of the United States. But by 1980, thanks to a growth rate in excess of 10 percent per year, Japan had surpassed all but the U.S. and had reduced the U.S.-Japanese gap by a considerable margin.

Less widely appreciated is the economic success achieved by Korea, Thailand and Indonesia. During the 1960's, the annual increase in output was 9.1 percent per annum in Korea, 7.6 percent per annum in Thailand, and a healthy, if not spectacular, 3.8 percent per annum in Indonesia. During the 1970's, despite considerably less favourable world-wide economic conditions, Thailand, Korea, and Indonesia each recorded annual rates of growth exceeding seven percent as compared with 4.4 percent for Japan and less than three percent for the United States. In no sense, then, is Japan a singular example of Asian economic success.

Nor was progress in these nations limited to the economic arena. In 1960, Japanese life expectancy was the shortest of any industrial market economy. Today, it is close to the longest. In Korea, life-expectancy rose from 55 years in 1960 to reach 66 years by 1980. Although Thailand's per capita income is considerably less than Korea's, its life-expectancy of 62 years is not. Indonesia, with a considerably lower standard of living than the other countries, of course, has higher mortality; but even so, life-expectancy at birth increased from 47 years in 1971 to 53 in 1980. The four Asian countries have made similar gains in education, health care and other areas.

A common feature of these countries, particularly important to this study, is that each has experienced a precipitous decline in fertility. Among Japanese women, the total fertility rate (TFR) had already fallen to 3.65 births per woman by 1950. Within a decade, however, the TFR dropped to two births per woman, slightly below the level necessary to sustain population, and it has remained near that level ever since. As late as 1960, the total fertility rate was six and

one-half births per woman in both Korea and Thailand, and although precise data are not available for Indonesia, the TFR probably exceeded six there as well. Subsequent years witnessed a speed of fertility decline that exceeded even that observed in Japan. By 1975 the TFR had dropped to 3.2 births per woman in Korea and to 4.4 in Thailand, and by 1980, the rate was close to 2.5 in Korea and below four in Thailand. Although Indonesian fertility declined more slowly than in Korea or Thailand, the reduction from 5.5 births per woman in 1971 to 4.4 births per woman today is still substantial.

Equally important to this study are the differences among these countries. They vary enormously in their standards of living, in their industrial structure, in their demographic situation, and in the population policies and institutions created to reduce fertility. Japan and Korea, to be sure, share a common cultural heritage and approach economic policy in terms of export-oriented, private enterprise systems operating under strong central guidance designed to emphasize industrialization and growth. But in 1960, they stood at remarkably different stages of development. Per capita income in Korea was only 20 percent of that in Japan; nearly 60 percent of the Korean labour force was engaged in agriculture, compared to only 30 percent in Japan, and 57 percent of Korean adults were entirely without schooling of any kind, compared to only three percent in Japan.

Thailand and Indonesia are more richly endowed with natural resources than either Korea or Japan, but both remain predominantly agricultural and livings standards are low. In 1980 per capita income in Thailand was only half that of Korea and in Indonesia, less than a quarter.

Because of this diversity, the recent histories of Indonesia, Japan, Korea and Thailand offer an ideal opportunity to explore the complex interaction between population change and economic growth. Analysis of this history is necessarily complex, for population change impinges on the economy at many different points. The rate of increase in the number of adults of working age depends on the population growth rate. Labour force participation by women is influenced by their fertility. The skills that workers bring to the workforce are determined, in part, by schooling decisions that are in turn influenced by demographic factors. And the capital required for workers to carry out their jobs also depends on population: when population and labour force grow rapidly, a larger share of the national product must be devoted to capital accumulation merely to maintain the level of equipment per worker, but the rate of investment is, itself, reduced by population growth.

Assessing the impact of population growth on the economy is, in large part, an empirical matter. Although empirical work is sound only to the extent that it is based on sound theory, theory by itself can only direct us to the right questions, it cannot provide the answers. Many theories have been advanced regarding the ways, favourable and unfavourable, by which population change affects the economy. Which of the many mechanisms are most important? Are there circumstances, countries, or times when certain demographic effects are important and others when they are not? Which of the theories proposed adequately describe economic and demographic processes? Which do not? It is only possible to address these questions by confronting theory with experience.

THE POPULATION AND DEVELOPMENT PROFILE

Because of the complex interrelationships between demographic change, human resource development, and economic growth, careful assessment of these processes is facilitated by employing an econometric model. The model used herein is an elaboration of one published earlier (Suits and Mason, 1978) and consists of a system of equations statistically fitted to data drawn from a cross-section consisting of every nation in the world with a labour force of at least one million workers.

Figure 1 (Figures can be found in section beginning on page 57) is a highly schematic representation of the structure of economic development and demographic change. Proceeding from the top left across the figure, we see that per capita GNP affects labour force participation, enrolment, urbanization, the total fertility rate, mean age at childbearing, and, along with improvements in technology, life expectancy at birth. The total fertility rate is also affected by urbanization, child mortality, and educational attainment. Total fertility and mean age at child bearing translate into age-specific fertility rates (ASFR), while life expectancy translates into age-specific survival rates. These combine to determine the rate of increase in population, its size and its age structure. The age structure of the population, along with past educational attainment, and past school enrolment combine to determine current educational attainment. Next, the figure shows the three key components of economic growth: labour force size, determined by per capita income, school enrolment, and demographic characteristics of the population; labour force quality, determined by educational attainment and population; and investment, determined by the rate of growth of income and the population growth rate. These three factors combine to determine growth in GNP which, together with population growth carries us back to the left side of the figure with a new level of per capita GNP.

THE STANDARD PROFILE

If we begin at the left with per capita income, population, labour force, investment rate, educational endowment and other characteristics of a modern, poor developing nation, we can, with the aid of a computer, work across the figure to determine new conditions to be expected from one year's development. The new conditions become the new starting point for a second year's development, and so on for as many years as we choose to simulate.

The resulting standard profile is shown in Table 1. The table shows the development path to be expected of a nation with an initial (year 0) GNP per capita (GNP/N) equivalent to $US 100, of which 20.4 percent is saved and invested (GCF/GNP). Of the population of working age, 73.4 percent of the men and 36.1 percent of the women are employed. Farming occupies 75.1 percent of the labour force, the remainder is engaged in urban occupations. The total fertility rate is 5.45 births per woman, life expectancy (e^0) at birth is 41.3 years and the population growth rate (RNI) is 1.59 percent per year. Of children of approximate ages, 78.6 are enroled in elementary school, 24.5 percent are enroled in secondary school and 1.7 percent are in college. The educational attainment of the adult population is correspondingly low and implies an average productivity only 1.33 times that of an uneducated work force.

TABLE 1

PROFILE OF DEVELOPMENT

Year	Economic Factors				Demographic Factors				
	GNP/N	GCF/GNP	LF Part		Farm	TFR	EO	RNI	POP
			Male	Female					
0	100	0.204	0.734	0.361	0.751	5.45	41.3	15.9	100
10	143	0.189	0.734	0.362	0.741	4.96	44.4	16.4	117
20	202	0.190	0.731	0.367	0.716	4.70	47.3	17.3	138
30	282	0.190	0.731	0.369	0.683	4.47	49.8	17.1	164
40	395	0.195	0.725	0.369	0.640	4.26	52.4	16.9	195
50	561	0.203	0.722	0.371	0.581	4.01	57.4	17.8	231
60	797	0.209	0.716	0.370	0.504	3.73	65.4	19.0	277
70	1149	0.223	0.705	0.368	0.409	3.45	68.3	17.8	335
80	1745	0.243	0.695	0.368	0.293	3.13	69.3	15.6	398
90	2786	0.260	0.684	0.367	0.175	2.75	70.7	13.2	462
100	4729	0.284	0.680	0.374	0.129	2.35	72.8	10.3	524

Year	Enrolment Ratios			Educational Attainment				
	First	Second	Third	None	First	Second	Third	Weight
0	0.786	0.245	0.017	0.361	0.489	0.139	0.011	1.33
10	0.827	0.323	0.022	0.318	0.501	0.168	0.013	1.40
20	0.854	0.378	0.025	0.249	0.505	0.229	0.017	1.44
30	0.877	0.436	0.028	0.195	0.483	0.301	0.021	1.48
40	0.899	0.499	0.032	0.155	0.445	0.376	0.024	1.51
50	0.935	0.584	0.036	0.125	0.394	0.453	0.028	1.54
60	0.989	0.698	0.041	0.102	0.333	0.533	0.032	1.57
70	0.990	0.806	0.048	0.084	0.256	0.623	0.037	1.59
80	0.990	0.946	0.058	0.064	0.178	0.716	0.042	1.62
90	0.990	0.990	0.073	0.044	0.114	0.792	0.050	1.65
100	0.990	0.990	0.097	0.030	0.065	0.847	0.058	1.67

From this initial state, a nation whose performance matched that of the world average would grow, in 100 years, into a developed country with real per capita income approaching $5,000 of the same purchasing power, an increase of about 50 times. Population would grow to more than five times the initial level, but fertility would have been cut by more than half. After falling for most of this time, the crude death rate would have begun to rise as an increase in the elderly population accompanies slowing population growth.

The nation would have gone through a demographic transition from a high fertility, short-lived society to one with low fertility, long life and slow and declining population growth. Labour force participation by males would have declined steadily, in keeping with rising school enrolment and earlier retirement, while that of women would have varied irregularly, with only modest growth under the opposing influences of falling fertility and rising school enrolment. Enhanced education would have raised the average productivity weight in the labour force 25 percent above its initial level. The proportion of labour force engaged in farming would have fallen to 13 percent, with a corresponding increase in urbanization of the population.

The average growth rate of real GNP per capita would have averaged nearly four percent per year over the entire period, but it would have accelerated somewhat. Annual growth would average only 3.4 percent over the first half of the period, but would rise to 4.3 percent during the second half. These growth rates are higher than have generally been observed historically over long periods. (In the U.S., for example, growth of GNP per capita averaged only about two percent per year over the past century.) But the high rates of the profile are quite reasonable when we recognize that they represent development under ideal conditions unmarred by wars, economic depressions, natural calamities or political upheaval.

USES OF THE STANDARD PROFILE

The standard profile depicts a long-run path of income and population that is consistent with observed differences among modern nations. As such, it is interesting in its own right but, more important, it helps to isolate and analyze the effects of policy measures designed to contribute to development. For example, before we can evaluate the true effect of an official programme intended to reduce fertility, we must be able to distinguish what is attributable to the programme from what would be expected to occur naturally in the course of development. But the historical development of any one nation departs from that of the standard profile for any number of reasons, of which the official programme is only one. An unusually rapid decline in fertility, for example, might be largely the result, not of the official programme, but of an unusually rapid rise in income, or an accelerated effort at education.

One way to analyze the effect of a family planning programme, while holding all other factors constant, is to replace the standard fertility relationship with another that embodies the official programme. When the simulation exercise is repeated with this new relationship, any differences between the new profile and the standard is immediately attributable to the total effect of the

official programme, all other things equal (See Mason and Suits, 1981; Suits and Mason, 1978b).

This technique can be applied not only to evaluation of policy measures, but also to assess the elements that affect the development of particular nations. This is accomplished by comparing the relationships among economic and demographic factors as found in the country in question with the corresponding relationships as derived above from the world cross-section. Where the relationships are significantly different, new profiles can be simulated; in each instance, one of the country-specific relationships is employed in place of that in the standard. Comparison of these new country-specific profiles with the standard yields insight into the dynamics of development of the particular country under study.

The summary of findings that follows is divided into two principal sections. The first is devoted to the causes of the demographic changes observed in the four Asian countries, both in terms of what would be expected from economic development as expressed in the standard profile, and of what has been contributed by policy actions or cultural factors specific to the countries in question. To the extent that official policy is involved, the resulting change is a cause rather than a result of economic development. In the second section, we examine the contributions of these country-specific factors to observed rates of economic growth and other important features of the economy.

DEMOGRAPHIC CHANGES AND THEIR CAUSES

MORTALITY

Historically, great demographic shifts have almost always been initiated by changes in mortality. In more recent times, the dramatic decline in the mortality rates of many developing countries is without question one of the great successes of modern development efforts. Indonesia, Japan, Korea and Thailand have been full participants in the modern mortality transition. As shown in Table 2, starting from 1960, life-expectancy in Korea rose by 13 years to reach 66 years of age by 1980. This amounted to an average increase of two-thirds of a year of life per year of elapsed time. Japanese life-expectancy increased from 60 in 1950 to 76 by 1980, an annual average increase of .55 years of life. Of the four countries considered, Indonesia, at 52.7 in 1978, had the lowest life expectancy, but has, accordingly, experienced the most rapid gains. The rate of increase has been slower in Thailand than in the other three countries, with life-expectancy increasing by only seven years between 1960 and 1980. Even so, life expectancy in Thailand remains unusually high in comparison to most other countries at similar levels of development.

These advances in longevity are particularly remarkable compared to those typically experienced by Western countries during their mortality transitions. Life expectancy among Western countries, as measured by the average of seven European countries and the State of Massachusetts, increased by an annual rate of only about 0.25 years of life between 1840 and 1960. Furthermore, as indicated by comparison with the development profile, the four Asian nations improved more rapidly than would be expected of developing countries in general. Improvements in life expectancy along the standard profile can be traced

TABLE 2

TRENDS IN LIFE EXPECTANCY (AVERAGE OF MALE AND FEMALE): INDONESIA, JAPAN, KOREA, AND THAILAND

Country	Years Covered	Life Expectancy		Gain Per Year
		Beginning	Ending	
Indonesia	1971-1978	46.5	52.7	.89
Japan	1950-1980	59.8	76.3	.55
Korea	1960-1980	52.4	65.8	.67
Thailand	1960-1980	55.0	62.0	.35

to two sources. One is rising income, with the accompanying improvement in housing, nutrition, sanitation, and other living conditions. The other is the steady advance of health knowledge, technology, and awareness that occur over time. Thus, as originally pointed out by Preston (1975) not only do those living in economically advanced countries today enjoy longer life, but even those still living under relatively deprived conditions can expect longer life than their forebearers.

Table 3 compares rates of increase in life expectancy observed in the four Asian nations with those predicted from the improvement of technology over time and from improvements in their respective standards of living along the standard profile. Life expectancy is observed to grow more rapidly than predicted, but on average, the predicted increase of .50 additional years of life per year of elapsed time compares favourably with an observed average of .59 years. The evidence indicates, then, that most of the rapid increase in life expectancy enjoyed by the four Asian countries can be attributed to economic growth exceeding that observed in most other countries of the world.

At the same time, however, the impact of changing income on life expectancy among the Asian countries does differ in important respects from that in other countries. Assuming the role of technology to be the same in Asia and at the world level, life-expectancy in Asia is consistently higher at each level of income than is true for the world average. In addition, compared to the world average, Asian life expectancy tends to rise more rapidly with income at low income levels, but more slowly at higher income levels.

TABLE 3

PREDICTED AND ACTUAL LIFE EXPECTANCIES IN ASIA

		Life Expectancy		Annual Increase	
Country	**Year**	**Actual**	**Predicted**	**Actual**	**Predicted**
Indonesia	1971	46.5	—		
	1978	52.7	50.35	.89	.54
Japan	1950	59.8	—		
	1980	76.3	74.1	.55	.48
Korea	1960	52.4	—		
	1980	65.8	65.3	.67	.64
Thailand	1960	55.0	—		
	1980	62.0	63.8	.35	.33
Average	—	—	—	.59	.50

There are so few comparative studies of the determinants of general mortality in Asian countries, that it is difficult to go much beyond speculation in addressing what factors might account for the differences in mortality patterns observed here. Preston's 1980 analysis of life-expectancy trends in developing countries between 1940 and 1970 emphasizes the contribution of education and food intake in addition to the per capita income and technological improvements. Gwatkin (1980) and Ruzicka and Hanslowka (1982) raise concerns about the availability of health care to some segments of developing country populations and about poor nutrition resulting from inadequate food production and distribution. Most certainly income distribution, characteristics of diet, social structure, industrial pollution, and environmental factors beyond human control play their own roles as determinants of mortality.

Differences in educational attainment may account, in part, for the higher life-expectancy observed for the four Asian countries. As discussed in more detail below, Japan has unusually high levels of educational attainment, given its per capita income, and attainment in Korea and Indonesia have risen quite rapidly in recent years. Taking men and women together, Thailand does not have a particularly high level of education, but the attainment of women is high in comparison with other countries at comparable levels of development. Income distribution may also be a favourable factor accounting for higher life expectancy. Korea, in particular, has a very equitable distribution of income for a country at its level of development. Reliable data on Indonesia are not available, but income statistics for Thailand and Japan indicate that their distribution is relatively equal, as compared with many other countries.

FERTILITY DECLINE

The relationship of fertility to economic development has long been a subject of theoretical speculation and empirical research. Many studies have shown that increased education, especially of women, tends to reduce fertility (for example, Michael, 1974; Rosenzweig and Evenson, 1976; Cochrane, 1979). Urbanization is also recognized as closely related to fertility reduction (Kuznets, 1974). In addition, it has been shown that increased child survival leads to fewer births (Ben-Porath, 1976; Schultz, 1976; Preston, 1978; Scrimshaw 1978; Trussel and Olsen, 1983).

The influence of income on fertility continues to be a matter of dispute. Some economic theorists contend that, other things being equal, higher income generally leads to more children (Becker, 1960; Becker and Lewis, 1973; Willis, 1973—but for an alternative view, Easterlin, et. al, 1980). While results of empirical studies are mixed, the direct effect of income on fertility does appear to be small (Schultz, 1973; Simon, 1974).

In the standard profile, fertility is linked to child survival, education, income, urbanization and religion by an equation statistically fitted to data from the world cross-section of nations as of 1970. The contribution of each factor to fertility decline can be calculated by holding all others at their levels as of the beginning of each decade and calculating the change in TFR associated

with the change in the factor in question. As shown in Table 4, which gives the decomposition for three decades, the importance of each factor varies along the profile. At early stages, education exerts the most pressure on fertility, whereas at later stages increasing income has more impact.

TABLE 4

DETERMINANTS OF FERTILITY DECLINE

Year	Initial Fertility	Change in Fertility	Due to			
			Urbanization	Education	Income	Survival
10-20	5.01	0.30	0.05	0.17	0.04	0.04
50-60	4.00	0.26	0.09	0.04	0.09	0.05
90-100	2.81	0.38	0.02	0.01	0.35	0.01

Comparison of World-Wide Trends in Fertility to the Standard Profile

Since the standard profile is derived from a cross-section of countries in the world today, it is important to compare its performance to actual historical experience. Table 5 compares recent trends in the crude birth rate for major developing regions of the world. In East Asia (which includes Japan and Korea) and in Latin America the crude birth rate has been declining substantially faster than the standard profile. In South Asia (which includes Indonesia and Thailand), the rate of decline has been much nearer to that of the profile, whereas there is no evidence of any fertility decline at all among African nations during the last twenty-five years.

TABLE 5

TRENDS IN THE CRUDE BIRTH RATE: MAJOR REGIONS AND THE STANDARD DEVELOPMENT PROFILE

Place	Years					Total Change
	1955-59	1960-64	1965-70	1970-75	1975-80	
Africa	46	47	46	46	47	-1
Latin America	43	41	39	36	33	10
East Asia	39	33	31	26	22	17
South Asia	44	42	44	41	38	6
Profile	38	37	36	35	34	4

Sources for Regional Data: United Nations, Demographic Yearbook, various issues. Profile values are for years 0 to 15.

Comparison of the Standard Profile with Recent Experience in Indonesia, Japan, Korea and Thailand

The fertility patterns embodied in the profile are those observed worldwide as of 1970, but they are roughly representative of the situation in Indonesia, Japan, Korea and Thailand at that time. Table 6 compares actual fertility rates to those expected given the educational attainment, child survival, urbanization, and income observed in each country. The total fertility rates for Indonesia in 1971 and Korea in 1970 were only 0.2 to 0.3 births per woman higher than predicted from their respective levels of socioeconomic development. Fertility rates of Japanese women in 1970 were about half a child less than the level predicted. On the other hand, in 1970, Thai women had almost one child more than the calculated value.

Although observed fertility levels accord well with the standard profile, rates of decline over time do not. As shown in Table 7, whereas the standard profile takes thirty years to reduce fertility by one birth per woman, the total fertility rate in Korea from 1960 to 1980 and in Japan from 1947 to 1960 declined at the rate of one birth every five years. In Thailand, the rate of decline was one birth every six years. Even in the case of Indonesia, fertility declined 50 percent more rapidly than the standard profile would predict.

That fertility has declined so rapidly in Japan, Korea and Thailand is widely appreciated by those familiar with the demographic experience there. Considerably less well understood is why they have experienced such rapid change, but two sets of causes can be distinguished. In the first place, development in the four Asian countries has been more rapid, and the rate of fertility decline has been correspondingly greater, than in developing countries in general. Secondly, cultural and institutional factors (e.g., family planning) affecting fertility in these countries differ from those in the rest of the world. These unique features have caused fertility in the four Asian countries to decline more rapidly than would have been expected, even given their exceptional rates of economic progress.

TABLE 6

ACTUAL AND PREDICTED FERTILITY FOR INDONESIA, THAILAND, KOREA AND JAPAN

Country	Actual TFR	Calculated TFR	Difference
Indonesia			
1971	5.47	5.22	0.25
Thailand			
1970	5.6	4.7	0.9
Korea			
1970	4.27	4.04	0.23
Japan			
1970	2.14	2.59	-0.45

TABLE 7

DECLINE IN TFR FOR INDONESIA, THAILAND, JAPAN, KOREA, AND THE DEVELOPMENT PROFILE

Country	Years of Observation	Fertility Decline		Years for One Birth Decline
		Total	Per Year	
Indonesia	1971-1980	0.46	0.05	20
Thailand	1961-1980	3.00	0.16	6
Korea	1960-1980	3.74	0.19	5
Japan	1947-1980	2.80	0.08	12
	1947-1960	2.54	0.20	5
Profile	0-100	3.05	0.03	30
	0-50	1.45	0.03	30
	50-100	1.60	0.03	30

TABLE 8

THE IMPORTANCE OF RAPID DEVELOPMENT FOR FERTILITY DECLINE IN INDONESIA, JAPAN, KOREA AND THAILAND

Date	TFR		Average Annual Rate of Decline		Decline Associated with:		
	Actual	Eqn. 1	Actual	Eqn. 1	Normal growth	Rapid growth	Special factors
Indonesia							
1971	5.47	5.23					
1980	4.67	4.76	.089	.051	.030	.021	.038
Japan							
1947	4.54	3.94					
1960	2.00	3.14	.195	.062	.030	.032	.133
Korea							
1960	6.54	4.60					
1980	2.80	3.54	.187	.053	.030	.023	.134
Thailand							
1961	6.60	5.10[a]					
1980	3.60	4.30	.158	.042	.030	.012	.116

[a] calculated using 1960 data.

Table 8 separates the two sets of causes by comparing the total fertility rate recently observed in each nation to a corresponding rate calculated based on the standard profile, given urbanization, education, per capita income, and child mortality as of the same years. The rate of decline in the calculated values is an estimate of the contribution of economic growth to fertility reduction, and its difference from the observed decline constitutes an estimate of the contribution of non-economic factors. The contribution of economic growth is, in turn, decomposed into the .03 per year reduction associated with the rate of economic development along the development profile, and a residual attributable to the more rapid development observed in the Asian countries.

As the table shows, economic development accounts for from 25 to 60 percent of observed decline in fertility which leaves a substantial component of fertility decline associated with factors not taken into account in the standard profile. The role of these non-economic factors is clearly depicted in Figure 2, where observed total fertility rates are plotted on the vertical axis against calculated values on the horizontal. If observed changes in total fertility arose only from factors related to economic development, the path shown for each nation would parallel the diagonal line (corresponding to situations where calculated and observed fertility rates are equal). Plainly, fertility in Japan, Korea, Indonesia, and Thailand have declined more steeply than could be accounted for even by their rapid social and economic development.

Evidence from Household Data

The conclusion that rapid development, by itself, has not been sufficient to generate the fertility decline observed in the four Asian countries is of sufficient importance to examine in another way. Survey data that describes childbearing by women are available for Korea and Thailand during the early 1970's, in the midst of their fertility transitions.[1] Analysis of these data substantiates both the basic role of economic development and the importance of elements outside the development process detailed above.

Analysis of survey data permit age-specific fertility rates for Thai and Korean women to be related to development factors one at a time. Fertility rates calculated for women with selected characteristics are shown in Tables 9A and 9B. The top three rows in each table show age-specific rates for urban women with average child mortality experience, in households where both spouses have primary education. In the first row, however, household income is taken at only

[1]For Korea, data are available from the Korean World Fertility Survey (WFS) sample of 4050 ever-married women. Thai data come from the Survey of Fertility in Thailand (SOFT) conducted by the National Statistical Office of Thailand and the Institute for Population Studies, Chulalongkorn University, under the auspices of the World Fertility Survey. Although the latter survey included approximately 5000 ever-married women aged 15 to 49, analysis here is limited to the 3516 women aged 20 and older who responded to all relevant questions. (Almost 25 percent of the sample was eliminated for failure to indicate household income.) A complete description of the analysis is available in Mason and Suits, forthcoming.

TABLE 9A

AGE-SPECIFIC FERTILITY RATES AS CALCULATED FROM EQUATION (3) UNDER SPECIFIED CONDITIONS, KOREA*

	15-19	20-24	25-29	30-34	35-39	40-44	TFR
Income =							
.25 x mean	.12	1.54	1.51	.89	.31	.10	4.47
mean	.11	1.54	1.50	.87	.30	.09	4.41
2.5 x mean	.11	1.54	1.49	.83	.26	.07	4.30
Urbanization							
Urban	.11	1.54	1.50	.87	.30	.09	4.41
Rural	.10	1.14	1.45	1.13	.67	.34	4.83
Education. Both spouses have:							
Primary Ed.	.11	1.54	1.50	.87	.30	.09	4.41
Secondary	.10	1.03	1.55	.97	.31	.08	4.04
College	.10	1.03	1.69	1.12	.34	.08	4.36
Child Mortality							
mean	.11	1.54	1.50	.87	.30	.09	4.41
.01 below	.11	1.53	1.50	.87	.30	.09	4.40

*Except as indicated, all rates are calculated for urban women in households with average income and child mortality for age-urbanization group, and where neither spouse has more than primary education.

TABLE 9B

AGE-SPECIFIC FERTILITY RATES AS CALCULATED FROM EQUATION (3) UNDER SPECIFIED CONDITIONS, THAILAND*

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
Income =								
.25 x mean	.43	1.15	1.49	1.04	.57	.54	.26	5.48
mean	.43	1.13	1.38	.93	.52	.50	.25	5.14
2.5 x mean	.44	1.09	1.17	.72	.43	.43	.23	4.51
Education								
Low	.43	1.13	1.38	.93	.52	.50	.25	5.14
High	.10	.59	1.03	.73	.41	.33	.15	3.34
Urbanization								
Urban	.43	1.13	1.38	.93	.52	.50	.25	5.14
Rural	.59	1.31	1.41	1.25	1.04	.80	.29	6.69
Child Mortality								
Mean	.43	1.13	1.38	.93	.52	.50	.25	5.14
.01 below	.43	1.13	1.38	.93	.52	.50	.25	5.14

*Except as indicated, figures apply to urban women in households with mean income, and where neither spouse has had an elementary education.

twenty-five percent of the mean for the age-urbanization group. In the second row, income is taken at the mean, and in the third row, at two and one-half times the mean. Comparison of the calculated values shows the effect of income differences, all other things held constant. In similar fashion, other rows of the tables permit examination of the difference among women with different educational attainment, residence, or child mortality experience. When age-specific rates are summed over all ages, the result is the corresponding total fertility rate.

The survey confirms that fertility declines with rising income. In Korea, the ten-fold increase in income from a level that was 25 percent of the group mean to one 2.5 times the mean is associated with a 4 percent drop in total fertility rate; but among women 35 to 39, fertility declines by 17 percent, and by 30 percent among women 45 to 49. In Thailand, the corresponding decline in total fertility rate is 18 percent, and again fertility decline is greater among older women.[2]

In both Korea and Thailand, the surveys indicate that total fertility of better-educated households is significantly lower than that of the less well-educated. In Korea, education beyond primary school is associated with fertility rates about 10 percent lower than in households with primary-school education only. Survey responses of households with college educated spouses, however, display somewhat higher fertility than those with only secondary education, although fertility is still lower than those with only primary education. In Thailand, the total fertility rate in households where both spouses have at least a primary education is one-third lower than that among households in which neither spouse has attained that level of schooling.

Economic Development versus Other Factors

The standard profile and the survey analysis are both attempts to estimate the contribution of economic development alone to fertility reduction. Comparison of these estimates with recent historical records yields new insight into whether and to what extent the rapid fertility decline observed in Korea and Thailand involves something beyond economic development.

Table 10 presents three sets of estimates of the total fertility rate. The first row for each country contains published estimates for 1970-75 and for 1955-60. The second row contains estimates based on the survey data. For 1970-75, the rates are legitimate estimates of actual total fertility, and any difference from the corresponding estimate in the first row arises solely from differences in

[2]The greater apparent response of fertility to income in Thailand stems, at least in part, from bias due to a kind of "double counting" of the wife's employment status. The Thai sample reports only total household income including that of a working wife, and this is used in the analysis. But not only has a working wife lower fertility than other wives merely because she is employed, but her employment also adds to household earnings. This makes low fertility and high income, to some extent, merely different aspects of the same thing, which biases the estimated causal relationship between them.

TABLE 10

COMPARISON OF CHANGES IN TOTAL FERTILITY RATE IN KOREA AND THAILAND AS ESTIMATED BY DIFFERENT PROCEDURES, 1955-60 TO 1970-75

	1970 - 75	1955 - 60	Average Annual Decline
Korea			
KIFP	3.9	6.3	-.16
WFS	4.1	4.9[a]	-.064
Eqn. (1)	3.9[b]	5.2[c]	-.086
Thailand			
Composite Est.	5.0	6.6[d]	-.140
SOFT	5.6	6.0[a]	-.032
Eqn. (1)	4.6[b]	5.1[c]	-.026

[a]Back projection based on marital fertility equations derived from WFS data (Korea) or SOFT data (Thailand)

[b]1975

[c]1960

[d]1961

estimating procedure used and is unrelated to causal factors. For 1955-60, however, the figures in the second row are estimated by carrying back the analysis of the 1970-75 survey data, adjusted to match income, education, urbanization and percent of women married in each nation as of 1955-60. The resulting 1955-60 estimates of marital fertility bear the same relationship to income, education, and child mortality as those of 1970-75, so any difference between the two reflects the influence of these factors alone. Any difference between the average historical rate of fertility decline, as shown in the first row, and the calculated average displayed in the second row, however, is a measure of the extent to which factors other than economic development have played a role in fertility reduction.

The influence of economic development isolated from everything else is also estimated by evaluating the world cross-section relationship at the levels of income, urbanization, education and child mortality as observed in 1955-60 and in 1970-75, respectively. The results of these calculations are recorded in the third row for each country.

Despite the great differences in data and methodology, the three estimates of the 1970-75 level of Korean and Thai fertility are quite close. The close agreement of average annual rates of fertility decline within each country, as calculated from the survey analysis on the one hand and from equation (1) on the other,

confirms that economic development alone was responsible for an annual decline of .06 to .09 births in Korea, and of .02 to .03 births in Thailand. In both nations, however, the historical rate of fertility reduction was several times what can fairly be attributed to economic development. One half to two-thirds of the fertility reduction actually observed during the period 1955-60 to 1970-75 must be ascribed to factors other than development.

Non-economic Factors in Fertility Reduction

For those who have studied these countries and others like them, neither the remarkable decline in fertility nor its weak relationship to socioeconomic change can be any surprise. For example, the Thai family planning and fertility experience was most recently recounted by Rosenfield, et. al. (1982) and Peerasit, Apichat and Knodel (1982), while Knodel and Nibhon (1978), have offered a number of hypotheses that might explain the rapid pace of Thai fertility decline, stressing the possible contribution of family planning programmes, the importance of modernization, and the facilitating or inhibiting role played by cultural factors.

A recent report on Korea (Cho, et at., 1983) summarizes current evidence on fertility determinants by saying: "...economic and social development may be a fundamental cause of fertility transition. However, the family planning program has expedited the process...cultural factors, [such as] the absence of barriers to ready acceptance of abortion and sterilization, cultural homogeneity in ethnicity, language, and religious tradition, and geographic and political unity, have contributed to rapid fertility transition. The characteristics in turn promote social integration in the form of efficient communication and shared values, norms, and institutions." Likewise, rapid fertility decline in Japan has been attributed to population policy, the passage of the National Eugenics Law in 1948 (Mosk, 1977), facilitated by cultural factors such as those cited above (Yamamura and Hanley, 1975).

A common thread in these discussions is the view that although social and economic development underlies fertility decline, timing and pace are strongly influenced by imperfectly understood diffusion processes that are bound up in the interaction between population policy and cultural factors (Knodel, 1977; Freedman, 1979; Retherford and Palmore, 1983). To some extent, however, rapid fertility decline is surely attributable to increased "secularization" of society in both East and West. Even in Islam and in traditionally conservative Catholic nations, although fertility rates are significantly above the world average, there has been noticeable liberalization of attitudes on such matters as birth control and divorce.

On the other hand, cogent arguments have been made that change in the family and in the roles of its members is responsible for rapid fertility decline. Caldwell (1976), in particular, points to "Westernization" (which has proceeded largely independently of social and economic development) as the motivating force in the nucleation of families and the decline in the value of children and family size. Ben-Porath (1980) and Willis (1982) point to changes in the family institution more closely linked to social and economic development.

It is beyond our purpose to debate this issue here. Suffice it to say that basic development factors are demonstrable contributors to fertility decline. Countries that have enjoyed rapid social and economic development have, as a consequence, also experienced a faster decline in fertility. However, the particularly rapid fertility reduction experienced by Korea, Thailand, and Japan are in large part due to non-development factors.

URBANIZATION

Historically, steady migration from farm to city has been one of the most obvious concommitants of economic development. Indeed, so great is the urge to desert the farm that the exodus often continues even in the face of inadequate urban accommodations and high levels of urban unemployment. The theory of the occupational shift out of agriculture owes much of its formulation to Ranis and Fei (1961) and more recently to Todaro (1969), Harris and Tadaro (1970) and to Cordon and Findlay (1975). The formulation employed here is based on work by Suits, but the basic theory is relatively simple. As labour productivity rises, farm prices fall relative to those of other products. As a result, incomes of farmers fall behind those of industrial workers, and people desert the farm in search of economic advancement in urban areas.

The World Cross-section

Economic development is, of course, largely a process of rising productivity. Indeed, unless productivity rises, there can be no important gains in standards of living aside from whatever can be realized from shifts in relative prices (as recently illustrated by the consequences of the wide swings in world oil prices). It is this fact that generates the observed correlation between urbanization and per capita GNP.

The correlation is not, of course, perfect. Adjustments are not instantaneous, and in any event, differences in community tastes, resource endowment, and even in social and political organization create differences in labour allocation among countries with the same per capita GNP. In addition, observations in any given year are often influenced by purely temporary conditions that make the GNP per capita unusually high or low relative to its normal level. Nevertheless, among countries of the world, there is a high and highly significant negative correlation between GNP per capita and the percent of labour force employed in agriculture.

A curvilinear regression fitted to cross-section data drawn from 85 countries fits closely to the data for the five nations under study here. In Figure 3, Indonesia, Korea and Thailand scatter around the curve with low levels of GNP per capita, used as a proxy for labour productivity and high farm populations, while Japan and the United States fall almost exactly on the curve at positions consistent with their fully developed economies.

Historical Relationships of Productivity to Labour Allocation

To explore the relationship in greater detail, historical data are used to analyse the statistical relationship of the fraction of labour force employed on farms to productivity in the two sectors of the economy. Annual estimates of farm labour force, farm population and both farm and non-farm productivity, available since 1900, were used by Suits (1985) to explore U.S. occupational shift and farm migration, distinguishing the influence of rising productivity in the separate sectors, and also exploring the influence of shifts in equilibrium labour allocation on the dynamics of year-to-year farm migration.

Suits study of the U.S. shows that the rise in both farm and non-farm productivity generates a significant decline in the fraction of labour force employed on farms. As growth of productivity has steadily shifted the equilibrium allocation of U.S. labour away from the farm, the resulting disequilibrium has induced people to leave. The annual net number of people who leave farms in any given year is approximately proportional to the gap between equilibrium farm population—the number that would equalize farm and expected non-farm earnings—and the number of people who would be found on farms in the absence of migration. Regression analysis of U.S. farm migration since 1920 indicates that annual migration off the farm has amounted to about 15 percent of this gap.

Japan

The economic development of Japan has been accompanied by a major shift from agriculture to other industries as well. According to estimates in 1885 approximately 77 percent of Japanese workers were employed in agriculture. This had fallen to 45 percent by 1935, and to less than 10 percent by 1980. As in the U.S., the change occurred in close association with rising productivity in both farm and non-farm sectors, although Japanese productivity appears to have had a somewhat smaller effect during the period 1920-35, than during the post-war period of rapid economic growth, 1953-1980.

Regression analysis of Japanese data shows that annual migration from Japanese farms amounted to 7 to 10 percent of the gap between equilibrium farm population and population projected in the absence of migration. This is a somewhat slower response than that estimated for the U.S., but the two appear to be drawing closer together.

Korea

Although Korean data are available for a much shorter time period, they exhibit the same powerful relationship between rising productivity and fraction of labour force employed on farms. As labour productivity doubled in agriculture and increased five-fold in the non-farm sector, farm employment declined from over 60 percent of total labour force in 1963 to less than 33 percent in 1981.

This substantial decline in the proportion of labour force on farms, however, was not accompanied by a corresponding reduction in the actual number of

farmers. In fact, Korean farm employment grew steadily after 1963 to reach a maximum in 1976 and, although it declined thereafter, was only a little lower in 1981 than it had been at the beginning of the period. Meanwhile, the total labour force had doubled, cutting in half the proportion employed on farms. In short, nearly the entire natural increase in farm population sought employment in the non-farm sector. Unavailability of annual data preclude statistical estimation of the year-to-year dynamics of Korean migration, but the growth of urban population indicates its extent. The combined population of the cities of Seoul and Pusan, which had included 14.5 percent of total Korean population in 1963, grew to 30.7 percent by 1980.

Thailand

Useable data for Thailand are available only for the decade 1970-80, but this limited history exhibits the same strong negative influence of farm productivity on farm employment. A similar influence of non-farm productivity is, however, undemonstrated. In fact, rising non-farm productivity in Thailand appears to have contributed to an increasing, rather than declining fraction of the labour force on farms. It is unclear why this should be so. The result may amount to no more than a statistical idiosyncrasy for the particular time period, or it may arise from some difference in the economic structure (although it is difficult to imagine what this might be). In any event, rising farm productivity in Thailand shows more than three times the force in reducing agricultural employment that non-farm productivity appears to have in increasing it. When both rise together during the course of economic development, farm employment in Thailand still declines as a fraction of labour force, in keeping with the general proposition that economic development is accompanied by occupational shift away from agriculture.

Indonesia

Indonesia is in the earliest stages of development, and the number of farmers is still increasing. Between 1971 and 1980, the number of persons employed in agriculture rose by 13 percent, but this was much slower than the growth of total labour force and the proportion of labour employed on farms declined from 63.2 percent to 54.8 percent during this period.

During the same period, productivity per worker rose 24 percent on Indonesian farms and 51 percent in the non-farm sector. Although scarcity of information precludes formal statistical analysis of the Indonesian experience, the data clearly conform to the expected pattern. Rough calculations yield crude estimates about equal to those obtained for the U.S., Japan, and Korea.

The role of rural-urban migration as a natural and necessary consequence of the process of economic development has several important consequences. In the first place, although an increasing fraction of the farm population becomes redundant as productivity rises, only 7 to 15 percent of the redundant population leaves the farm in any given year. People simply cannot leave the farm fast enough to raise farm earnings to urban levels, even when the exodus exceeds

what the urban sector can absorb. This makes low farm earnings a fact of life in a developing economy. Economic policies designed to develop industry at the expense of agriculture often make the situation worse, but they are not responsible for the problem itself.

Nor are programmes intended to support agricultural prices powerful enough to dam the flood, and well-intended policies directed toward increasing agricultural productivity can only increase the rate at which people leave the farm for the city. Improvements in rural education, easier farm credit, higher-yield crops, cheaper fertilizer, and improved farm management have all been suggested at one time or another as ways to induce people to remain in agriculture. Although these measures all have merit in their own right, they still contribute to higher productivity and hence to more, rather than less, internal migration. A better policy is to leave the rate and direction of agricultural change to the operation of the market, and to concentrate on improvement of urban housing and urban infrastructure and on the provision of job opportunities for the migrants, for the migration itself is an intrinsic part of the process of economic development.

EDUCATION

Improved education is part and parcel of the demographic transition. Invariably as couples bear fewer children, they increase the amount invested in each child. In addition, concern about the role of education is heightened because, perhaps more than any other part of the development process, it is amenable to modification by governmental policy. For although they cannot ignore the economic and demographic realities that bear on decisions about education, all governments have considerable latitude in educational policy.

Figure 4 highlights some of the important structural differences among Indonesia, Japan, Korea, and Thailand as revealed by 1980 census data on educational attainment reported for those aged 25-29. The figure shows the principal schooling divisions in each nation and the age at which children normally enter and leave each. The figure also distinguishes vocational schooling from general secondary education, and indicates the educational attainment of 25-29 year olds by sex.

Japanese boys and girls typically enter primary school at six years of age, continue on to lower secondary at age 12, upper secondary at age 15, and complete secondary school at age 18. In all four Asian countries, a college degree generally requires four years for completion, but a significant number of recent Japanese graduates, particularly women, have completed a two-year junior college programme. Japan has the most advanced educational attainment of any Asian country, with virtually all members of recent cohorts completing the lower secondary grades and 80 percent completing the upper secondary programme. One-third of all Japanese men 25-29 have undertaken post-secondary education and, of these, the majority have completed a bachelor's degree. One-quarter of all Japanese women 25-29 have had post-secondary schooling, with a heavy concentration on junior college programmes.

Although Korean educational attainment is somewhat lower, the structure of the system is similar to that of Japan. In 1980 nearly all young Korean adults had attended primary school, about three-out-of-four young men and two-out-of-three young women had attended lower secondary, and about one-half of all young men and one-third of young women had attended upper secondary. About 15 percent of Korean young men, twice the figure for young women, had continued past the secondary level.

Until recently, the structure of the Thai educational system was quite distinct from those of the other countries.[1] Primary school consisted of a seven-year programme with four years devoted to mandatory lower primary schooling. As of 1980, the great majority of Thai men and women had completed the lower primary level, but few had gone farther. Only 30 percent of Thai men 25-29 and 20 percent of Thai women 25-29 had continued to the upper primary level. For those few who had, upper secondary education consisted of two streams: a general stream requiring five years to complete, and a vocational stream requiring six years to complete. Another distinguishing feature of the Thai system is that children enter school at age seven rather than six as in Japan and Korea.

The Indonesian system, like that of Japan and Korea, consists of a six-year primary level, upper and lower secondary levels of three years each, and a variety of post-secondary programmes of which the four-year baccalaureate is most frequently sought. Although as of 1980 the great majority of Indonesia men and women 25 to 29 had attended primary school, a much smaller percentage had actually completed the primary level. Only about 15 percent of all young men and 10 percent of all young women had any secondary education, and education beyond this level was rare.

School enrolment in 1980 is given by age in Table 11. In Japan and Korea, virtually all children between 6 and 15 are in school. Ratios appear lower in Indonesia and Thailand, but largely because schooling does not commence there until age seven. (In addition, the Indonesian ratio reported for children "6 to 9" actually applies to children 5 to 9.) As Figure 4 makes clear, nearly all Indonesian and Thai young adults have spent some part of their childhood in school, but the total number of years devoted to education among those under 15 is significantly lower than in Korea or Japan. There is substantial variation among the countries in the school enrolment of children over 15. In Japan, around 80 percent of those 15-19 are enroled. This ratio drops to 27 percent among 20-24 year old men and to 12 percent among women. Much lower levels are observed in the other countries. In general, school enrolments in the Asian nations tend to correspond to their respective levels of development with two important exceptions. First, among those 15-19, Indonesian enrolments are

[1] In 1978, Thailand adopted a 6-3-3 educational system with universal primary school. In addition, in 1970 and 1978, Thailand established open universities with enormous enrolments and limited faculties. UNESCO data does not include enrolments at open universities, but graduates of both open and of more traditional universities are included (but not distinguished) in census data.

TABLE 11

1980 SCHOOL ENROLMENT BY AGE, FOUR COUNTRIES

	Japan		Korea		Indonesia		Thailand	
	Male	Female	Male	Female	Male	Female	Male	Female
6- 9*	0.870	0.871	0.848	0.842	0.573	0.589	0.723	0.720
10-14**	0.999	0.999	0.975	0.960	0.820	0.782	0.690	0.637
15-19	0.791	0.812	0.636	0.538	0.409	0.267	0.293	0.248
20-24	0.275	0.124	0.122	0.056	0.099	0.040	0.092	0.072
25-29	0.015	0.003	0.029	0.002	0.024	0.010	0.020	0.015

*For Indonesia, this age group includes children 5-9; for Thailand, it covers ages 6-10.
**For Thailand, this age group includes children 11-14.

higher than Thai enrolments, despite lower per capita income in Indonesia. Second, female enrolment in Thailand is unusually high. Not only is the sex differential in Thailand much smaller than in the other countries, but female enrolment among those over 20 is higher than in either Korea or Indonesia and, for those 25-29, higher even than in Japan.

School enrolment on the standard profile depends on demographic and economic factors. Lower mortality and lower fertility, higher per capita income, and higher educational attainment among the adult population all lead to higher levels of schooling. In reality, of course, although these factors act as underlying constraints, individual countries have great lattitude in educational policy. School administration tends to be centralized in the national government, with the Ministry of Education responsible for establishment of admission quotas, staffing, curriculum development, budgetary matters and other aspects of educational planning. However there is a strong component of private educational effort: in Japan over one-quarter and in Korea about one-half of all secondary schools are private, and private schooling is an even more important factor at the post-secondary level. In Thailand, about one in eight students is enroled in a private school. The distinction between private and public institutions, however, is not always clear cut. The Indonesian system is unique in that about one-quarter of the educational institutions are Islamic schools, operated under the Ministry of Religion, many of which combine religious and secular training. In any case, private schools are often strictly controlled. In Korea, for example, the government controls admissions quotas and tuition for private universities.

Governments do not operate in a vacuum, however. Government decisions to expand the educational system arise partly from the value attached to education by the populace, for when mandatory levels of schooling are set too high, large segments of the populace tend to evade the regulations. Governments set admissions quotas to the university with an eye on the demand for college educated workers, and so on. Table 12 compares enrolment ratios in 1970 for

TABLE 12

COMPARISON OF ACTUAL AND CALCULATED ENROLMENT RATIOS FOR INDONESIA IN 1971 AND JAPAN, KOREA, AND THAILAND IN 1970

	Primary		Secondary		Tertiary	
	Calculated	Actual	Calculated	Actual	Calculated	Actual
Indonesia	0.786	0.695	0.245	0.133	0.043	n.a.
Japan	1.031	0.998	0.806	0.893	0.170	0.194
Korea	0.949	1.023	0.464	0.460	0.086	0.088
Thailand	0.927	0.825	0.313	0.161	0.050	0.023

Japan, Korea, and Thailand and in 1971 for Indonesia, with those calculated from the enrolment equations forming the standard profile, using the social and economic data for the respective countries. Given 1970 levels of social and economic development, Japanese enrolment exceeds what would be expected on the basis of world-wide experience. In Korea, 1970 primary enrolment is high given its level of development, but both secondary and college level enrolment are near expected levels. Enrolments in both Indonesia and Thailand, however, are consistently below the level that one would expect on the basis of world-wide experience.

Figure 5 compares recent experience in each country to that calculated for the country from the enrolment equation in the standard profile. Enrolment ratios for each country, calculated at ten year intervals, are plotted against those observed. If advances in enrolment were adequately captured by the profile, enrolment paths should lie along the diagonal. Departures from the diagonal indicate the extent to which enrolments are affected by policy and other factors omitted from the standard profile. Most primary and secondary enrolments lie within a broad band surrounding the diagonal, indicating that educational effort in these countries has been largely confined to what would be expected from the standard profile, but there are notable exceptions. In Indonesia, primary and secondary enrolments have both increased substantially faster than would be expected given the observed improvements in social and economic conditions, and secondary enrolment in Korea increased much more rapidly between 1970 and 1980 than would be expected even given Korea's remarkable economic development.

In each of the Asian countries, except Thailand, college enrolments have risen much more rapidly than predicted by the profile, even taking account of the rapid growth in their incomes. The slow growth of college enrolment along the standard profile is in keeping with the evidence of modern economies that college enrolments tend to exceed existing proportions of college-educated adults by only small margins. The experience of the Asian countries indicates, however, that rapid expansion of college education is possible in rapidly growing countries.

FERTILITY

It is hardly surprising to discover that fertility depends much more on human choice, as influenced by culture and social policy, than it does on economic growth. The really interesting question is how and to what extent does the exercise of this choice, in turn, impinge on economic growth? The question can be addressed by comparing the standard profile to a second simulation in which the path of fertility is replaced by a scheduled annual fertility reduction of .18 births per woman until the total fertility rate reaches 2.1, a level that is maintained thereafter. This scheduled decline is the average of those observed in Korea (1960 to 1980), Thailand (1961 to 1975), and Japan (1947 to 1960). Since all other conditions are identical, any differences that emerge between the standard profile and the new simulation reveal the impact of rapid fertility decline alone. The results of the rapid fertility decline simulation are summarized by Table 13.

Figure 6 shows that both populations grow from their initial base of 100 million, but along the standard profile population reaches 609 million (an average rate of increase in excess of 1.8 percent per year, compounded) compared to only 167 million with rapidly scheduled fertility reduction (an annual rate of about 0.5 percent.)

Shifts in age structure are compared in Figure 7, where age pyramids for the two simulations are shown together with comparable pyramids for the Korean population. Initially 39 percent of the simulated population is younger than age 15, a proportion about equal to that in Korea in 1975. After 50 years of simulation, this proportion has dropped to 36 percent in the standard simulation, but to 22 percent under scheduled rapid fertility decline. This is in striking agreement with Korean projections for the year 2025, 50 years after the 1975 pyramid.

By the end of the simulation, the proportion of the standard population under age 15 has fallen to 28 percent, whereas with simulated rapid fertility decline, the proportion reaches 20 percent. Along with reduced numbers of children there is, of course, a larger proportion of older people. From an initial 3.5 percent aged 65 and older, the proportion rises to 7.6 percent on the standard profile, and to over 15 percent with scheduled rapid fertility decline. This more rapid aging approximates what has been projected for Korea.

Table 14 reports population age distributions for all four Asian countries. Since fertility in Japan declined even more rapidly than the simulated schedule, and has a longer history than that of Korea, the Japanese population shows the greatest aging, with 21 percent of Japanese projected to be 65 or older by the year 2025 (Kuroda, 1979). The populations of Thailand and Indonesia, with fairly recent fertility decline, exhibit only moderate aging up to 1980, but more substantial aging anticipated for the remainder of this century.

TABLE 13

ECONOMIC AND DEMOGRAPHIC CHANGE WITH
RAPID FERTILITY DECLINE

	Economic Factors				Demographic Factors				
Year	GNP/P	GCF/GNP	Male	Female	FARM	TFR	Eo	RNI	POP
0	100	20.0	.735	.362	.751	5.45	41.3	15.9	100
10	143	18.5	.725	.375	.741	3.65	46.5	10.3	116
20	226	23.7	.732	.417	.713	2.10	51.9	4.4	126
30	419	30.7	.765	.440	.653	2.10	57.7	6.8	133
40	800	31.0	.765	.422	.537	2.10	68.7	7.5	143
50	1,468	29.8	.729	.394	.371	2.10	71.6	4.5	153
60	2,725	30.3	.702	.378	.196	2.10	73.2	3.1	159
70	5,048	29.3	.658	.359	.130	2.10	75.0	1.4	164
80	8,967	26.9	.617	.349	.040	2.10	76.4	-0.1	165
90	15,599	26.2	.596	.351	.040	2.10	77.2	0.6	165
100	26,478	25.4	.549	.345	.040	2.10	77.5	1.7	167

	Enrolment			Educational Attainment				
Year	First	Second	Third	None	First	Second	Third	Weight
0	.786	.245	.017	.484	.438	.071	.007	1.25
10	.838	.415	.020	.350	.485	.153	.012	1.29
20	.883	.573	.023	.270	.490	.225	.015	1.35
30	.927	.661	.028	.208	.423	.352	.018	1.41
40	.990	.802	.033	.163	.341	.476	.021	1.46
50	.990	.943	.042	.131	.272	.573	.024	1.51
60	.990	.990	.056	.101	.194	.677	.028	1.55
70	.990	.990	.082	.074	.126	.766	.034	1.58
80	.990	.990	.125	.052	.070	.835	.043	1.60
90	.990	.990	.198	.032	.032	.875	.060	1.62
100	.990	.990	.320	.018	.013	.878	.091	1.63

TABLE 14

AGE DISTRIBUTION OF FOUR ASIAN COUNTRIES, 1960-2000

		1960	1980	2000
Indonesia	0-14	42.6	40.3	34.2
	15-64	54.9	56.4	61.5
	65+	2.4	3.3	4.3
Japan	0-14	30.0	23.6	17.5
	15-64	64.2	67.4	67.6
	65+	5.7	9.0	14.9
Korea	0-14	42.3	34.0	26.0
	15-64	54.7	62.2	68.1
	65+	2.9	3.8	6.0
Thailand	0-14	43.2	40.0	27.4
	15-64	54.0	56.5	67.9
	65+	2.8	3.5	4.7

Implications of an Aging Population

The aging of population that accompanies rapid fertility decline has important consequences for labour force, labour productivity, real wages, and pension systems that are already being felt in Japan and are contemplated in the other Asian countries. Table 15 reports the average age of all working-age adults and the average age of employees. (Although closely related, the two are not the same because of the effect of declining fertility on labour-force participation by women of childbearing age.) There is little difference in the mean age of working-age adults or of employed workers in the two simulations until after the 25th year, because the impact of fertility decline on age structure is delayed. By year 50, however, adults and employed workers under the scheduled rapid fertility decline average about 5 years older than under the standard profile.

Between 1950 and 1975, Japan was the only one of our four countries where changes in the age structure were large enough to alter significantly the average age of workers. During this time, the average age of Japanese adults increased by three years, and an additional increase of two and one-half years is expected by 2000. Neither Korea nor Thailand has yet begun to experience significant labour-force aging, but significant aging is projected for the near future. In Indonesia, the relatively slow decline in fertility will keep the average age of the labour force roughly constant for the remainder of this century.

TABLE 15

AGING OF THE LABOUR FORCE

Country	Year	Mean Age	Year	Mean Age	Year	Mean Age
Standard Profile						
Adults, 15-64	0	33.9	25	34.3	50	34.6
Workers	0	34.0	25	34.7	50	35.5
Rapid Fertility Decline						
Adults, 15-64	0	33.9	25	34.6	50	39.3
Workers	0	34.0	25	35.1	50	40.3
Indonesia						
Adults, 15-64	1950	33.8	1975	33.8	2000	34.1
Japan						
Adults, 15-64	1950	34.5	1975	37.7	2000	40.1
Korea						
Adults, 15-64	1955	33.6	1975	33.2	2000	36.5
Thailand						
Adults, 15-64	1956	33.0	1970	32.9	2000	34.6

The implications of large changes in the age of the labour force are not completely understood. Recent changes have altered the age pattern of earnings in the United States (Freeman 1979; Welch 1979), in Taiwan (Lin 1982), and in Japan (Martin, 1982). Martin's analysis can be seen in Figure 8, which shows the age-earnings profile for Japanese males in 1960, 1965 and 1970. As the proportion of older workers increased, their earnings declined relative to those of younger workers. The trend was temporarily interrupted by the entry into the labour force of Japan's post-war baby boom cohort, but continued low fertility is expected to alter the age-earnings profile still further.

To the extent that worker characteristics vary by age, aging alters the industrial and occupational distribution of employment (Mason et. al., 1984). As the labour force ages, occupations and industries that typically employ older workers tend to grow vis-a-vis those that rely on younger workers. The consequences for Japan can be seen in the fact that in 1975, whereas the average Japanese worker was 38.1 years old, clerical and related workers were, on average, only 31.8 years old, but the ages of those employed in farming, lumbering and fishing averaged 48.7 years (Yasuo Kuwahara, 1979).

The effect of aging on the mobility of labour may be even more important. It is widely known that young workers are much more likely to move or to change jobs in response to changing economic opportunities. Between 1975 and 1980, for example, one in three Americans between the ages of 25 and 34 moved to a different county. Of those between the ages of 45 and 64, however, only one in eight moved (U.S. Department of Commerce, 1981).

In addition, prospects are often bleak for those older workers who must seek new jobs. For every 100 job applicants in Japan who were over age 50 in 1980, there were only seventeen jobs. But there were 140 available jobs for every 100 applicants under 25 (Furuya and Martin, 1981). This suggests that labour force aging diminishes economic flexibility by raising the costs of, and increasing the resistance to change.

Another aspect of population aging is the increased number of elderly. In Japan, for example, from 1920 to 1950 people 65 years and older constituted a stable 5 percent of population, but by 1980 they had reached 9 percent. The proportion is expected to reach 15 percent by the year 2000, and to exceed 20 percent by 2025 (Kuroda and Hauser 1981). A virtually certain consequence is an increasing share of national resources devoted to the support of the elderly. A recent study by Ogawa (1982) concludes that social security programmes in Japan could increase from 10 percent of national income in 1980 to nearly 30 percent in 2015, even if the pensionable age is raised by five years.

For countries only recently experiencing rapid fertility decline, "old-age" issues are less pressing than in Japan. After all, it takes 100 years after the onset of rapid fertility decline for the elderly population to reach 15 percent of the total, so the economic problems associated with the post-demographic transition era are still remote for most developing countries. By the year 2000, the elderly population is expected to constitute only 4.6 percent of the total in Thailand, 4.3 percent in Indonesia, and 6.9 percent in Korea.

EDUCATION

Although fertility reduction exerts a strong influence on the course of economic development through its effect on age structure, it's indirect influence via its stimulation of education may be even stronger. The impact of rapid fertility decline on schooling is illustrated by Figure 9, which compares enrolment ratios under the standard profile with those when fertility declines rapidly. The impact is sharpest at the secondary level, where falling fertility raises secondary enrolment by a substantial margin for an extended period. The effects on primary education and college are considerably smaller. Primary education is nearly universal in any case, and demographic factors exert relatively little influence. Although lower fertility eventually results in much higher college enrolment, no effect is observed for fifty years.

Table 16 gives detailed enrolment figures and cost figures for each of the four Asian countries during the 1970's, the U.S. in 1979, and the two simulation profiles. In Indonesia, Korea (prior to 1979) and Thailand, between 37 and 40 percent of the population is of school age (5 to 19). Consistent with their demographic and economic situations, however, the percentage of the popula-

tion enroled in school is lowest in Indonesia and highest, by a substantial margin, in Korea. In Japan, with the highest enrolment ratios of any Asian country, only about 20 percent of the population is in school, a fraction well below Korea, but higher than either Indonesia or Thailand. The pattern reflects conflicting forces. As development proceeds, countries educate an increasingly large proportion of their young, but as demographic transition proceeds, a decreasingly small proportion of the population is of school age.

Expenditures per student (in 1973 U.S. dollars) vary from a low of $20 per student in Indonesia to a high of $1,282 per student in Japan. Total public expenditures on education as a percent of GNP are highest in Japan, at nearly 5 percent; next highest in Korea, in the 3 percent range; and are around 2.5 percent of GNP in Indonesia and Thailand. In the U.S. in 1979 public expenditures were nearly 6.5 percent of GNP. These figures are entirely consistent with the simulation of rapid fertility decline. In year 50, enrolments are 27.3 million versus 53.6 million for the standard profile, but since the same percentage of GNP is devoted to education, expenditures per student are three times as great with rapid fertility decline. In year 20 and in year 70, however, the share of GNP devoted to education is higher with lower fertility.

Schooling and Employment

Although the rise in education ultimately increases labour productivity, its first consequence is reduction of the labour force as school-age workers are withdrawn from employment to attend school. Education competes for time with employment, marriage, childbearing, and other activities undertaken by men and women. In most countries, men between the ages of 15 and 65 are almost exclusively engaged in either schooling or employment, so that increases in school enrolment necessarily reduce employment. The situation for women is more complex because schooling competes not only with employment, but also with marriage and childrearing. Thus, at least when female employment is low and marriage is early, increased schooling for women can involve delayed childbearing together with increased, rather than reduced employment. Figure 10 shows how the trade-off between labour force and education appears in the standard profile. In the figure, the proportion of the population 15 to 19 years old enroled in school is plotted against the proportion in the labour force. As a reference, the diagonal dashed line shows situations in which labour force is the only alternative to attending school. Movement down the diagonal, from upper left to lower right, represents increased schooling accompanied by a one-for-one reduction in employment. Any proportion of population that is neither enroled in school nor in the labour force is represented by the vertical distance between an observation and the diagonal line. (To simplify the figure, we do not consider those people enroled in school but employed at the same time.) As development proceeds along the standard profile, the line corresponding to the behaviour of those of school age declines parallel to the diagonal, indicating that the result of rising school enrolment is very nearly a one-for-one reduction in labour force, the proportion engaged in other activity remaining nearly constant.

TABLE 16

ENROLMENT AND PUBLIC EXPENDITURES ON EDUCATION

	Enrolments (millions)					Public Expenditures Per Student	Expenditures, Percent of GNP
	Level 1	Level 2	Level 3	Total	As Percent of Population		
Indonesia							
1970	14.9	2.5	0.2	17.6	15.2	819	2.5
1975	17.8	3.6	0.3	21.6	16.5	20	2.3
1976	22.0	4.5	—	—	—	—	—
Korea							
1970	5.7	1.9	0.2	7.9	24.4	858	3.6
1975	5.6	3.1	0.3	9.0	25.5	49	2.2
1979	5.6	4.0	0.5	10.1	27.0	102	3.4
Japan							
1970	9.6	8.7	1.8	20.0	19.3	5622	3.9
1975	10.3	8.8	2.2	21.3	19.1	863	4.5
1979	11.6	9.3	2.4	23.2	19.8	1.282	4.9

Thailand							
1970	5.6	0.7	0.1	6.4	17.6	822	2.5
1975	6.7	1.2	0.1	8.0	19.4	41	2.6
1979	7.2	1.8	0.5	9.5	21.0	47	2.4
STD Profile							
0	11.4	3.1	0.2	14.7	14.7	819	2.8
20	17.6	6.9	0.4	25.0	17.7	29	2.6
50	33.7	18.9	1.0	53.6	21.2	61	2.5
70	47.6	38.3	6.9	92.8	25.0	157	3.3
Rapid Fertility Decline							
0	11.4	3.1	0.2	14.7	14.7	819	2.8
20	15.4	9.8	2.7	23.6	18.7	35	2.9
50	13.6	13.4	2.3	27.3	17.9	207	2.5
70	13.0	12.7	2.6	28.3	17.3	1,118	3.6
United States							
1979	28.6	15.2	11.6	55.33	24.6	81,684	6.4

Figure 11 depicts the behaviour of males aged 11-14, 15-19, and 20-24 in Indonesia, Japan, Korea, and Thailand at selected years for which data are available. The concentration of observations near the diagonal indicates that, in all years shown, the great majority of males at these ages were either employed or in school. Moreover, with the passage of time, the behaviour of males has converged toward the diagonal, indicating a shrinking percentage engaged in other activities. Korean men in their early twenties constitute the most notable exception to this generalization, as the percentage neither in school nor in the labour force rose from 12 percent in 1960 to 14 percent in 1980. Exact numbers are unavailable, but most of these young men were undoubtedly in military service. Nonetheless, the central point is quite clear: increased school enrolment of young men has come primarily at the expense of labour force participation.

The situation of women, as shown in Figure 12, is quite different. Many women of marriageable age devote their efforts exclusively to homemaking and childrearing, although Thai women of all ages and Japanese teenagers are two groups that appear to be fully engaged in either schooling or employment. In virtually every group pictured, the percentage of women who are neither in school nor at work declined over time. Thus, increased schooling of women has come partly at the "expense" of childrearing rather than employment.

Wages and Productivity

In the long run, education repays the lost production attributable to reduced labour force with the increased productivity of educated workers. It is generally conceded that education increases the productivity of workers, although the exact magnitude of the contribution and the proper method of its measurement are much debated. The available direct evidence is that average wages rise with educational attainment. By way of illustration, Figure 13 gives the average monthly wages in 1980 of Korean men employed full-time by firms with ten or more workers. Those with a college education earn, on average, more than two and one-half times what is earned by those with no more than a middle school education.

In the standard profile, annual earnings grow approximately 6.7 percent for each additional year of schooling. Although comparable information is unavailable for Indonesia, wage differentials associated with education in Japan, Korea and Thailand are substantially the same as those in the standard profile.

Table 17 reports the ratio of wages of Japanese workers with higher educational attainment to those with the lowest reported level of education and the percentage increase per additional year of educational for selected years. The data, available for 1964, 1970 and 1980, are generally consistent with the profile values. Two sets of figures are provided. Contractual wages are predetermined wages or salaries, whereas bonuses are awarded biannually and sometimes depend on the economic fortunes of the employer. In general, bonuses constitute a larger share of annual earnings of managerial rather than production workers and hence, are more often received by workers with more education. In 1980, for example, among regular employees of industrial establishments with five or more employees, the annual bonus varied from 18 percent of total

TABLE 17

RELATIONSHIP BETWEEN WAGES AND EDUCATIONAL ATTAINMENT: JAPAN, 1964, 1970, AND 1980. FOR 1980, REGULAR EMPLOYEES OF INDUSTRIAL ESTABLISHMENTS WITH FIVE OR MORE EMPLOYEES. FOR 1970 AND 1964, SALARIED EMPLOYEES OF INDUSTRIAL ESTABLISHMENTS WITH FIVE OR MORE EMPLOYEES.

Level (years)	Contractual Wages			Including Bonuses		
	1980	1970	1964	1980	1970	1964
	Relative Wages					
Lower Secondary (9)	1.00	1.00	1.00	1.00	1.00	1.00
Upper Secondary (12)	1.17	1.05	1.07	1.22	1.09	1.10
Junior College (14)	1.38	1.20	1.22	1.47	1.36	1.35
College (16)	1.64	1.34	1.35	1.81	1.57	1.52
	Percentage Increase Per Year of Schooling					
Lower Secondary	—	—	—	—	—	—
Upper Secondary	5.2	1.6	1.4	6.6	2.9	3.2
Junior College	8.3	2.4	6.6	9.3	11.1	10.2
College	8.6	5.5	5.1	10.4	7.2	5.9
Average	7.4	3.2	4.4	8.8	7.1	6.4

Notes: Bonus estimates based on bonus ratio for each educational group with no allowance for age variation.
Sources: Japan, Minister of Labour, *Yearbook of Labor Statistics*, various (Tokyo).

annual earnings for workers with only a lower secondary education to 26 percent for workers holding a college degree.

Total earnings by Japanese workers were higher by 6.4 percent for each additional year of schooling in 1964, the first year for which data are available. The value is close to the 6.7 percent figure used for the profile, but the premium to education is gradually increasing in Japan. By 1970, the percentage difference per year of schooling is 7.1 percent and by 1980, it is 8.8 percent. The apparent upward trend in the education premium may be misleading, however, because the 1980 data include both hourly and salaried employees, whereas the 1964 and 1970 data are restricted to salaried employees. In addition the Japanese premium for additional education varies with the level of education. The lowest "returns" accrue to those who stop at high school, while the highest "returns" accrue to those with a junior college education in 1970 and 1964, and to those with a four year college education in 1980.

TABLE 18

RELATIONSHIP BETWEEN WAGES AND EDUCATIONAL ATTAINMENT; KOREA, 1971 AND 1980. FULL TIME MALE WORKERS EMPLOYED BY FIRMS WITH TEN OR MORE EMPLOYEES.

Level (years)	Contractual Wages			Including Bonuses		
	1983	1980	1971	1983	1980	1971
	Relative Wages					
Primary (6)			n.a.			1.00
Middle (9)	1.00	1.00	n.a.	1.00	1.00	
High School (12)	1.35	1.39	n.a.	1.41	1.45	1.25
Junior College (14)	1.69	1.85	n.a.	1.75	1.94	
College (16)	2.30	2.43	n.a.	2.51	2.66	1.79
	Percentage Increase Per Year of Schooling					
Primary (6)	—	—	—	—	—	—
Middle	—	—	—	—	—	
High School	6.4	7.0	—	7.3	7.9	5.0
Junior College	11.2	14.3	—	10.8	14.6	
College	15.4	13.6	—	18.0	15.8	7.9
Average	11.0	11.6	—	12.0	12.8	6.4

Notes: Those with middle school or less combined for 1980 with average of 7.3 years of schooling estimated from census data for 1980. For 1971, middle and high school combined with 11.5 estimated years of schooling and junior college and college combined with 15 years of schooling estimated. Sources: Korea, Economic Planning Board, *Wage Survey of Korea, 1980* (Seoul); Wi-Sup Song, *The Change in Quality of the Labor Force and Its Effect on the Economic Growth of Korea*, Ph.D. Thesis, University of Hawaii (August 1981).

Korean data for 1980 and 1983, given in Table 18, show wages growing an average of about 12 percent with each additional year of schooling. As in Japan, premiums were greater at higher levels of education. In 1971, on the other hand, Korean earnings differentials averaged only 6.4 percent per year of education, slightly lower than the value used for the profile.

Analysis of household income data from the Thailand World Fertility Survey shows that, on average, an additional year's education for the household head raises income by 8.6 percent, or about two percentage points higher than the value underlying the standard profile. Differences in household income are not, of course, entirely traceable to differences in wages. Employment of both the husband and wife varies with the educational attainment of the husband, so that differences in household income may overstate or understate differences in the husband's wage. Nonetheless, the pattern of household income in Thailand is roughly in keeping with the differentials in wages employed in the profile.

The influence of fertility on labour force via age structure and schooling can best be summarized by measuring labour force not merely by numbers of workers but by weighting workers by their productivity in order to obtain a measure of "effective workers." The implications of fertility decline for total labour force and the corresponding number of effective workers is shown in Figure 14.

FERTILITY AND THE SAVING RATE

Recent saving and investment rates in Indonesia, Japan, Korea and Thailand have varied widely, as shown in Table 19. The Japanese saving rate, already high in 1950, has averaged over 35 percent of GNP during the last two decades, the highest of any industrialized country, and roughly double the U.S. rate. Saving rates in the other countries, although well below Japan, are still about average by international standards. The savings rates of 70 major countries averaged about 20 percent over the period 1960 to 1980, somewhat higher than the rates observed in Thailand, but slightly below those most recently seen in Korea and Indonesia. Except in Thailand, where saving rates have been confined within a band only 2.5 percentage points wide, rates have varied markedly over time. Sharp upward trends have been evident in Korea and Indonesia, whereas the saving rate in Japan soared from under 30 in the 1950s to peak above 40 in 1970, before falling in more recent years.

The trends in saving in the four Asian countries differ greatly from those of the standard profile. As can be seen in Figure 15, Japanese saving has been consistently above that of the standard profile, while saving in Korea and Thailand is consistently below.

The upward trend in the standard profile saving ratio is accounted for by two factors: declining child dependency and a higher rate of economic growth.

TABLE 19

GROSS NATIONAL SAVING RATIOS: JAPAN, KOREA, THAILAND, AND INDONESIA

Year	Japan	Korea	Thailand	Indonesia
1950	29.0	—	—	—
1955	24.8	—	—	—
1960	33.1	—	15.5	—
1965	33.6	9.3	16.5	—
1970	40.9	17.2	14.0	12.7
1975	33.6	20.7	16.7	18.8
1980	32.3	22.0	16.1	23.4

Notes: See appendix for sources.

Empirical evidence on the saving-population link was first provided by Leff (1969) with important subsequent contributions by Mueller (1976) and qualifications by Bilsborrow (1973 and 1979) and Ram (1982 and 1984). The standard profile embodies research by Mason (1986) showing that population growth does not affect the saving rate independently, but in conjunction with the rate of economic growth. That is, although some growth of GNP is necessary if saving is to exceed merely what is accumulated for bequests, the amount of saving induced by any given growth rate of GNP depends on child dependency ratios. The lower the ratio, the greater the saving rate expected to accompany any given rate of income growth.

Predicted versus Observed Saving Rates

Much of the differences between the standard profile saving ratio and the saving ratios observed in the four Asian countries can be attributed to differences in the dependency ratio and the rate of growth of income. This is demonstrated by Table 20, which reports observed value and calculated values obtained by evaluating the standard profile relationship using historical data on the dependency index and rate of growth of income for each country.

Fifty years ago, prior to the demographic transition and years of high economic growth, the Japanese were saving only 10 percent of the GNP. Since the end of World War II, however, with relief from the tax burden of military spending combined with an unusually favourable demographic climate and rapid economic growth, the Japanese saving rate rose sharply to above 40 percent in 1970. From this peak in 1970, dependency has not declined further, but income growth has slowed considerably. Not surprisingly, savings rates have fallen as well. Figures in Table 20 show that, except for the irregularities associated with military build-up and the immediate aftermath of the war, economic growth and demographic change have predominated in the determination of Japanese saving rates. They accounted for most of the large postwar increase up to the 40 percent for 1970, and for the subsequent decline. However, it appears that other factors have been responsible for sustaining more recent Japanese saving rates, for savings have not fallen as rapidly as predicted based on world-wide experience.

Indonesian data permit the calculation of saving rates for only the years 1971, 1976, and 1980. The calculated values uniformly come within two percentage points of those historically observed. The actual increase in saving of 10.7 percentage points between 1971 and 1980 is very nearly identical to the calculated increase of 10.5 percentage points.

The experience of Korea and Thailand indicates that important factors other than economic growth and changes in age structure have contributed to alteration of their saving behaviour, for their historical saving rates differ substantially from those that are calculated when historical values of growth and dependency rates are substituted into the saving equation. Observed rates are consistently lower than those predicted from the equation. Unusually low rates

TABLE 20

COMPARISON OF OBSERVED AND CALCULATED SAVING RATIOS FOR FOUR ASIAN COUNTRIES

Country / Year	Observed	Calculated	Difference
Indonesia			
1971	12.7	13.1	-0.4
1976	18.8	21.8	-3.0
1980	23.4	23.6	-0.2
Japan			
1955	24.8	32.6	7.8
1960	33.1	33.2	-0.1
1965	33.6	33.2	-0.1
1970	40.9	40.8	0.1
1975	33.6	33.5	0.1
1980	32.3	24.2	8.1
Korea			
1965	9.3	14.8	-5.5
1970	17.2	25.0	-7.8
1975	20.7	29.1	-8.4
1980	22.0	28.9	-6.9
Thailand			
1960	15.5	13.9	1.6
1970	14.0	19.2	-5.2
1980	16.1	23.1	-7.0

Notes: Values calculated only for years for which D and g are available; g is calculated as the average rate of growth of GNP over the preceding ten years.

of saving in Korea have been noted by others (Williamson, 1979; Fry and Mason, 1982) and attributed to the high rates of direct foreign investment characteristic of the recent Korean experience. It should be noted, however, that the rapid increase in Korean saving between 1965 and 1980 is accounted for by more rapid economic growth and demographic change. The observed increase in saving of 12.7 percentage points is close to the calculated increase of 14.1 percentage points.

Thai saving has varied cyclically from near 10 up to 20 percent or higher since 1960, but with no noticeable trend. The observed value for 1960 is quite

close to the calculated value, but the saving increase, predicted by a somewhat lower dependency ratio and a somewhat higher rate of growth of income, has not materialized.

One of the reasons that in some cases saving has diverged from predicted values is that the standard profile relationship fails to capture some of the important dynamics of the population-saving relationship. More detailed demographic data for Japan shows that, despite its rapidly changing age structure, the numbers of retired households relative to those with members of earning age have yet to rise, possibly accounting for saving ratios higher than those predicted after 1975. But as the proportion of retired households increases over the foreseeable future, saving may well decline to values more nearly comparable to those observed in the U.S. and in European countries. Detailed analysis of Thailand demographic data shows that, unlike Korea and Japan, the decline in child dependency has been concentrated among households with older mothers. In the immediate future, as child dependency declines across the board, an increase in saving is more likely to occur.

The interaction between income growth and demographic change constitutes an important qualification to earlier research on the relationship of saving to demographic change, for it implies that saving gains from slower population growth are reaped only in proportion to already existing economic growth rates. This is one of the ironies of economic development, for it implies that lowered birth rates provide the greatest immediate savings increase to countries that are already developing rapidly. Population control yields little immediate increase in savings rates in poor countries that are developing slowly to begin with.

In countries with even modest economic growth, the evidence presented here indicates that rapid fertility decline can result in substantially higher rates of saving. The experience of Indonesia, Japan, and Korea corroborates that view. Rapid economic growth and sharply falling child-dependency ratios coincided in Japan and Korea, with attendent high saving rates. And in Indonesia and Thailand, projected demographic shifts should lead them to substantially higher saving rates in the near future.

The effect of reduced fertility on economic growth is measured by comparing the year-by-year level of per capita GNP on the standard profile with that of one generated by conditions that are the same in all respects, except that the path of fertility decline follows that characteristic of the recent experience of Japan and Korea. The two are compared in Figure 16, which shows, along the standard profile, that per capita income grows at 3.7 percent per year, whereas the simulation with rapid fertility decline generates a growth rate of 5.6 percent.

The entire demographic transition takes longer than the 100 years simulated, but further analysis shows an ultimate return to steady growth at rates about equal to those that prevailed before fertility began to decline. Because of the long time involved, it is impossible to observe the complete profile in the history of any single country. According to recent trends, Indonesia, Korea and Thailand appear to be on the up-swing. Each is experiencing fertility decline, rising savings rates and increasing rates of growth of GNP. Demographic and economic change in Japan since 1950 was also probably part of the up-swing

period, but Japan appears to have reached its peak and to have entered a stage where we may expect saving rates and rates of economic growth to decline.

The conclusion that rapid fertility decline leads to a higher standard of living is not immune to challenge. Julian Simon has presented a number of arguments in recent years to question the view that rapid population growth impedes economic development. Recent studies by Boserup (1981), Ruttan and Hayami (1985), and Binswanger and Pingali (1985) present valuable evidence that population pressure contributes to the speed with which new technology is adopted.

The issues can be resolved only by analysis of data that are, unfortunately, frequently unreliable and subject to a wide range of interpretation. The comparison of development profiles provides strong evidence that reduction of fertility does raise the rate of economic growth, at least for a period of several decades, and contributes to permanently higher living standards.

THE CONSEQUENCES OF REDUCED MORTALITY

Lower mortality and longer life have had far-reaching economic and social implications. Many observers, however, view mortality decline as a mixed blessing to developing countries, for with longer life comes more rapid population growth and all its attendant problems. (See Barlow's analysis of malaria eradication in Sri Lanka, for example.) To explore the implications of different rates of change in mortality, the standard profile is compared with two additional simulations, in each of which everything is kept the same except the way life expectancy is affected by income and health technology. In the first alternative simulation, the standard income-life expectancy relationship is replaced by one embodying experience of the four Asian countries. In the second, the relationship in the standard profile is replaced by the slower decline in life-expectancy experienced by the Western nations.

Schooling and Educational Attainment

Lower mortality raises the rate of return to investment in education, because more children survive beyond school age to enter the labour force, and because educated workers have longer productive lives. This increased value induces society to send more children to school and to invest more heavily in their education. The effect of longer life expectancy on enrolment rates in primary and secondary school is shown in Figure 17. Since the Asian profile exhibits higher life expectancy at the outset of the simulation, Asian enrolment rates in primary and secondary school are about 10 percentage points higher than in the standard case. Life expectancies for the standard and Western profiles are nearly equal in year 0, but as life-expectancy in the standard profile rises more rapidly, so do enrolment ratios. Universal primary school enrolment is attained by the Asian profile in year 40, the standard profile by year 60, but by the Western profile only after 100 years. Likewise, by year 25 in the Asian simulation, half of the population of secondary-school age are enroled in school, an enrolment ratio not achieved by the standard profile until year 40, and not until year 50 by the Western profile.

Fertility

Lower mortality contributes to lower fertility as women have fewer births in response to increased survival of their children, but the impact on the TFR is small. TFR in Asia is consistently only about 0.2 births per women below the standard profile, and in Western nations about 0.1 births per woman above the standard. In year zero, the difference between the profile with Asian fertility and the standard is accounted for solely by differences in child mortality. By year 50, however, increasing the Asian child mortality to the standard level of that year would increase the Asian TFR by only about .1 births.

Crude Death Rates

Although the initial crude death rate of the standard profile coincides with that of the Western sample and is 8 points higher than the Asian, it falls more rapidly than either of the others. After 80 years, the standard roughly coincides wtih the Asian and is below that of the West. Beyond this point, both the standard and the Asian profiles exhibit rising crude death rates, corresponding to the transition to an older population age structure which the Western profile has not yet attained.

Labour Force

The impact of reduced mortality on labour force depends on which age groups experience the greatest changes in death rates. In general (and particularly when life expectancy is low), when death rates fall, they fall most sharply at the youngest ages. Thus, as life expectancy rises, so does the proportion of population below working age. Declining fertility, however, tends to reduce this proportion, so when lower mortality induces lower fertility, the effects on labour force tend to cancel each other out. This is borne out by the comparisons of Table 21 which show only minor differences among the three profiles in proportion of population of working age.

TABLE 21

PERCENTAGE OF THE POPULATION OF WORKING AGE, THREE DEVELOPMENT PROFILES

Year	Standard	Asian	Western
0	58.0	56.6	58.0
25	58.7	58.3	59.6
50	59.6	59.4	60.9
75	60.9	61.2	62.2
100	64.4	65.0	65.2

As is characteristic of most populations experiencing fertility decline, the proportion of people of working age rises, and the labour force grows somewhat faster than the population as a whole. It is clear, however, that the differential does not vary in any consistent or important way among the alternative mortality profiles and has little bearing on differences in rates of economic growth.

Income

The net influence of declining mortality is summarized by the behaviour of income. In Table 22, total and per capita GNP levels and growth rates are given at selected years for the Asian, Western, and standard profiles. Over the entire hundred year simulation, the growth rates of per capita income are barely distinguishible. Although lower mortality does initially reduce living standards, as measured by per capita GNP, the reduction is both small and temporary. In the first decade of the simulation, the Asian profile, which embodies the most rapid reduction in mortality, is the lowest of the three, with per capita GNP about 9 percent below that of the Western profile, which embodies the slowest mortality reduction. Even if there were no further economic ramification, this might be considered a small price to pay for longer life, but even this small cost is temporary. By the middle of the simulation, and by year 80, it has become the highest of all three. In other words, the small investment in the form of an initial reduction in per capita income purchases not only longer life, but in the long run, yields a higher income than would otherwise be possible.

TABLE 22

THE EFFECT OF MORTALITY ON POPULATION, GNP AND PER CAPITA GNP. GROWTH RATES GIVEN IN PARENTHESES.

	Standard	Asian	Western
Gross National Product			
20	27.5 (.050)	28.5 (.055)	27.3 (.049)
50	132.8 (.055)	156.0 (.059)	116.7 (.049)
80	757.0 (.061)	966.3 (.062)	532.6 (.053)
100	2,707.7 (.066)	3,505.9 (.066)	1,620.6 (.058)
GNP per Capita			
20	194 (.031)	185 (.033)	201 (.034)
50	525 (.035)	522 (.038)	560 (.035)
80	1,668 (.044)	1,783 (.046)	1,707 (.040)
100	4,447 (.055)	4,838 (.055)	4,137 (.049)

The ability of the economy to absorb substantial mortality reduction with little impact on GNP per capita is not peculiar to the cases examined here. Similar results are obtained when the analysis is replicated for countries with very high fertility. With an initial TFR over seven and standard mortality assumptions, GNP per capita grows 2.52 percent per year. Given Western mortality patterns, the average rate of growth is 2.54 percent per year and for Asian mortality patterns, the growth rate is 2.59 percent per year. Additional analysis confirms the robust nature of the finding that mortality decline does not adversely affect standards of living to any significant extent.

The demonstrated absence of substantial deterioration of per capita income as a consequence of rapid mortality decline in developing countries may constitute an unexpected but welcome result of our analysis. Concern over the possible negative implications of mortality reduction has been based on an oversimplified view of the process of economic development. When account is taken of the far-reaching effects of longer life on schooling, fertility, and labour force, the economic costs of more rapid population growth traceable to mortality reduction are seen to be, at worst, both small and temporary.

THE CONTRIBUTION OF EDUCATION

Education is among the most important investments for a developing country to make. It is through its influence on schooling that fertility reduction contributes a substantial part of its indirect influences on growth. Beyond this, however, the outlay on education is one of the most powerful ways in which governments can speed up their rate of development. We conclude this summary of research findings with an estimate of the purely economic payoff obtained from investment in education.

Measurement of the Returns to Education

The deviations of enrolment ratios in the Asian countries from those predicted by the standard profile are a measure of the extent to which investment in education by these countries departs from the expected average. The returns from this investment have been complex and are difficult to measure, but we can make an estimate by comparison of development along the standard profile with development along another in which all initial conditions are identical except for school enrolment. In the alternative, virtually all children of primary school age are initially enroled, together with 60 percent of those of secondary school age, and 15 percent of those of college age. These are proportions similar to those currently observed in Japan and Korea, but the secondary school enrolment is not reached for 50 years on the standard profile and college enrolment is initially established at rates never reached at all in the standard. The results of the alternate simulation are given in Table 23.

Comparison of the two profiles shows the cost of increased education in reduced GNP per capita for the first 30 years of the period, resulting from the lower labour force participation rates of school-age workers, and from reduced saving rates associated with slower initial growth of income. As time passes, however, the improved caliber of the labour force begins to enhance labour productivity. Rising productivity, in turn, not only increases per capita income, but also induces people to move more rapidly into urban areas which, together with rising literacy, contributes to lower fertility. By the 40th year, GNP per capita has recovered to that in the standard profile. By the end of the simulation, GNP per capita not only stands 15 percent higher, but is growing more rapidly than the standard.

Increased education has little effect on fertility for the first 30 years or so; but thereafter, as a greater number of people become literate, as rising productivity shifts population out of rural areas, and as incomes rise, the fertility rate falls below that of the standard profile. Accumulated over the 100 years, the effect of increased education is a total population about five percent smaller.

The impetus of faster economic development carries school enrolments well beyond the levels initially instituted. Nearly universal secondary education is reached 10 years sooner than in the standard profile, and college enrolments—already above standard—are carried beyond the original 15 percent policy level.

Comparison of the two profiles enables us to estimate the present value of the expected gain from increased education using techniques described by Mason and Suits (1981) whereby the total gain in any given year is defined as the amount of GNP that the population could give up and still retain a material standard of living equal to what would have prevailed in the absence of the new schooling policy. Given the two simulations, this gain is readily calculated year by year. The total gain is the present value of the entire sequence of annual benefits discounted to the beginning of the simulation.

Table 24 shows the estimated benefits under three alternative real discount rates. Also shown is the present value of the estimated direct cost outlays required by the additional schooling. At a real discount rate of three percent, the present value of the gain from the educational programme (net of losses in GNP during the early years of the profile) works out to about $440 billion, compared to discounted direct costs of only about $45 billion. At a real discount rate of five percent, the present value of benefits is reduced to $80 billion. The source of the reduction is, of course, that losses associated with reduced labour force participation, incurred early, are less affected by discounting than benefits realized many years later. At an (unrealistically high) 10 percent real discount rate, the difference in timing causes the present value of early losses to exceed that of subsequent gains, yielding a net loss of about $4.5 billion even before the $3 billion discounted direct costs of the increased schooling are taken into account.

TABLE 23

PROFILE OF DEVELOPMENT: ENHANCED EDUCATIONAL PROGRAMME

Year	Economic Factors				Demographic Factors				
	GNP/N	GCF/GNP	LF Part		Farm	TFR	Eo	RNI	Pop
			Male	Female					
0	0.100	0.201	0.735	0.362	0.751	5.45	41.3	15.9	100
10	0.137	0.165	0.692	0.334	0.741	5.02	46.4	17.7	118
20	0.185	0.187	0.696	0.342	0.722	4.73	50.8	19.0	141
30	0.263	0.200	0.694	0.346	0.692	4.44	54.9	19.2	171
40	0.379	0.208	0.693	0.352	0.648	4.16	58.5	19.1	207
50	0.553	0.215	0.692	0.355	0.586	3.89	63.3	19.5	251
60	0.804	0.220	0.686	0.355	0.505	3.61	69.8	19.8	305
70	1.184	0.229	0.678	0.355	0.403	3.34	72.0	18.1	371
80	1.809	0.243	0.670	0.354	0.283	3.03	73.0	15.9	442
90	2.888	0.259	0.670	0.362	0.168	2.69	74.1	13.3	515
100	4.870	0.277	0.664	0.369	0.130	2.32	75.3	10.3	584

Year	Enrolment Ratios			Educational Attainment				Weight
	First	Second	Third	None	First	Second	Third	
0	0.786	0.245	0.017	0.484	0.438	0.071	0.007	1.25
10	0.990	0.600	0.150	0.350	0.485	0.153	0.012	1.30
20	0.990	0.600	0.150	0.270	0.428	0.242	0.061	1.40
30	0.990	0.600	0.150	0.189	0.336	0.378	0.097	1.47
40	0.990	0.600	0.150	0.116	0.283	0.477	0.124	1.53
50	0.990	0.670	0.150	0.068	0.242	0.548	0.143	1.56
60	0.990	0.773	0.150	0.037	0.210	0.599	0.155	1.59
70	0.990	0.874	0.150	0.020	0.167	0.652	0.161	1.60
80	0.990	0.990	0.150	0.010	0.123	0.706	0.162	1.62
90	0.990	0.990	0.157	0.006	0.089	0.744	0.162	1.63
100	0.990	0.990	0.176	0.006	0.059	0.772	0.163	1.64

TABLE 24

BENEFITS AND COSTS OF A SCHOOLING PROGRAMME

Discount Rate	Benefits	Costs
0.03	$443.3 B	$45.2 B
0.05	79.9 B	11.7 B
0.10	-4.4 B	3.2 B

The internal rate of return to investment in education is the real discount rate that equates the present values of costs and benefits. Since benefits greatly exceed costs at a rate of five percent, but are smaller than costs at 10 percent, the internal real rate of return to investment in education lies between the two, at about nine percent.

CONCLUSIONS

Every industrialized nation goes through a demographic transition from a predominantly rural, illiterate society with high birth and death rates to a predominantly urban, educated society with low birth and death rates. But because the decline in mortality precedes the reduction in fertility, populations increase several fold during the transition. Among leading Western industrial nations the transition required well over a century, whereas in Indonesia, Japan, Korea and Thailand, the transition is taking place in barely more than a decade or two. Equally dramatic has been recent economic performance, with gross domestic product increasing over the periods studied at an annual rate of 7.0 percent in Indonesia and Japan, 7.4 percent in Thailand, and 8.1 percent in Korea—an enviable record in comparison to almost any country.

What can we conclude about the situation, organization or policy of these countries that has contributed to their rapid economic development and to the speed of their demographic transition? It is univerally recognized that economic development and demographic change occur together and fertility declines as part of the same process that generates economic growth. So strong is this effect that in the minds of some people, "development is the best contraceptive." Yet fertility in our four countries has declined much more rapidly than the standard profile predicts. Part of this acceleration has occurred because these countries have developed so rapidly, but even after allowing for this, we find that only one-half to one-third of the observed decline in fertility can fairly be ascribed to the development process itself. The remaining half to two-thirds must be attributed to something specific to these countries.

A variety of forces have combined to speed fertility transition in the four Asian countries. Indonesia, Korea and Thailand have had a strong national commitment to family planning backed up by effectively administered, country-wide birth control programmes. Two recent studies of Indonesia (Freedman, et al., 1981, and McNicoll and Singarimbun, 1983) cite vigorous family planning programmes, along with social and economic development, as critical to rapid fertility decline. Studies of Korea and Thailand, cited above, reach similar conclusions about the importance of family planning to fertility decline in those countries. Only in Japan did government-sponsored family planning play a minor role. None the less, the legalization of abortion and the elimination of other legal impediments to family planning were important to the decline in Japanese fertility after World War II.

Beyond the pace of economic development and the commitment to family planning, there are doubtless strong cultural elements at work. The populations of Japan, Korea, and Thailand, with a long history of Chinese influence, are less individualistic and more group minded than is generally true in the West. This greatly adds to the leverage of family planning programmes, as has

been so evident in the People's Republic of China. Although Indonesia's cultural heritage is quite distinct, the government there has been able to rely on a political system that extends very effectively to the grassroots level where fertility decisions are made. Thus these four countries, each in its own way, have been able to achieve substantially lowered fertility commensurate with improved levels of social and economic development.

Efforts to reduce fertility have immediately reduced the number of child dependents without reducing the number of adults of working age. The result has been a rapid increase in per capita income for three reasons: (1) fewer children has meant fewer mouths to feed; (2) fewer children has enabled more women to enter the labour force; and, (3) fewer children has led to lower aggregate consumption, higher saving, and additional investment in physical capital. In Indonesia and Thailand, where rapid fertility decline has occurred only recently, the impact on economic growth has been less evident. But in Japan and Korea, where fertility decline began earlier and has been more substantial, the impact on growth has been evident and the higher material standards enjoyed there are, in part, a product of rapid fertility decline.

But as Japan and Korea reach demographic maturity, and are followed later by Indonesia and Thailand, the evidence marshalled here does not support the continuation of rates of economic growth characteristic of the fertility transition. As the transition is completed, labour force growth slows and saving rates return to lower levels, the rate of economic growth should return to rates not substantially different from those observed prior to the transition.

Fertility decline is not the only demographic force with potential for influencing the economic record of our four Asian countries. Preceding the decline in fertility have been improvements in nutrition, sanitation, housing and prophylactic medicine that have been pushing down death rates—an event viewed with some ambivalence by many. It is one of the unexpected results of this study that, although lower mortality may reduce per capita income, the reduction is both small and temporary. Thus, there is no mystery that Japan, Korea, Thailand, and Indonesia have been able to achieve rapid economic growth despite significant population growth brought on by the decline in mortality.

By historical standards, the increase in life-expectancy in Indonesia, Japan, Korea and Thailand has been unusually rapid, but the improvement is commensurate with their rapid economic development. Unlike the reduction in their fertility and the expansion of schooling, however, there is no evidence that special efforts by these countries or sociocultural factors that differentiate them from other countries of the world have played an important role in their mortality transitions.

Urbanization has also been, primarily, a product of the development process. As productivity of both farm and industrial workers has risen, the discrepancy between real earnings of industrial workers and those of farmers has induced workers to shift into industrial occupations and to migrate to urban areas. Although it has supplied the labour requirements of expanding industry, the occupational shift has constituted part of the trauma of economic development, for at times workers have deserted agriculture faster than they could be absorbed by industry and have moved out of rural areas more rapidly than they

could be comfortably accommodated by the existing urban infrastructure.

The four Asian countries examined here have all invoked migration policy at one time or another. Indonesia and Japan have both experimented with transmigration programmes, in Indonesia to shift population from Java to less populated islands and in Japan to increase the population of Hokkaido. Korea has employed a number of policies aimed at slowing the growth of Seoul, and Thailand has been particularly concerned with the growth of Bangkok, but there is no strong evidence that these efforts have slowed the rate of internal migration.

Like the other demographic processes, expanded school enrolment is normally associated with economic development but, even more than fertility, it is amenable to a wide range of policy activity. The emphasis on education has varied considerably among the four countries of our study. Korea and Japan have consistently maintained higher levels of schooling among their young than would be expected even given their levels of social and economic development. Indonesia and Thailand have, by contrast, lagged somewhat behind, particularly at the primary and secondary level, although Indonesia has very recently made great strides in upgrading the level of education among its young.

In neither Thailand nor in Indonesia, then, is there evidence that their economic success has been built upon particularly strong educational programmes. But in both Korea and in Japan, high levels of schooling have undoubtedly contributed to both economic and demographic success. Increased education has not been without its costs, including lost labour time from the diversion of young men and women from the work place into the classroom. Education's contribution to economic and demographic processes have been multifaceted: increased productivity of the labour force and lower rates of childbearing take on particular importance.

To summarize, the demographic processes central to our analysis are inextricably bound up in development, partly as a natural consequence, more importantly as casual contributors. Because Indonesia, Japan, Korea and Thailand have enjoyed such remarkably rapid economic development, they have also experienced rapid fertility decline, rapid mortality decline, rapid urbanization, and rapid increases in schooling and educational attainment. But fertility has declined more rapidly than can be ascribed merely to development. Except in Japan, family planning efforts apparently have been instrumental in bringing down birth rates. This externally induced decline in fertility has had an important bearing on several important features of these Asian countries including their age structure, their investment in schooling, the size and productivity of their labour force, the level of saving, and the growth of per capita and total product. Thus, the evidence presented here indicates that the rapid pace of economic growth is, in part, a consequence of successful family planning efforts.

Figure 1

FLOW CHART OF SUITS AND MASON DEMOGRAPHIC-ECONOMIC MODEL

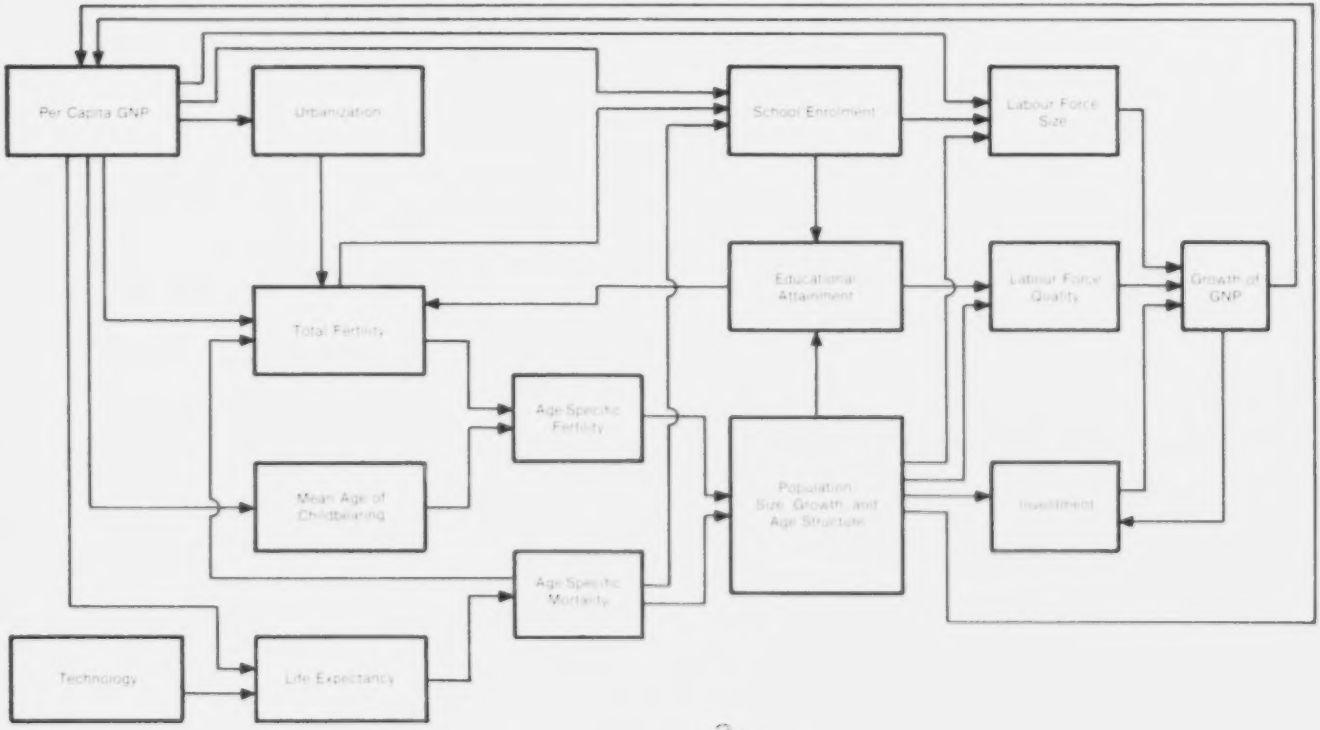


Figure 2

COMPARISON OF CALCULATED AND OBSERVED TOTAL FERTILITY RATE

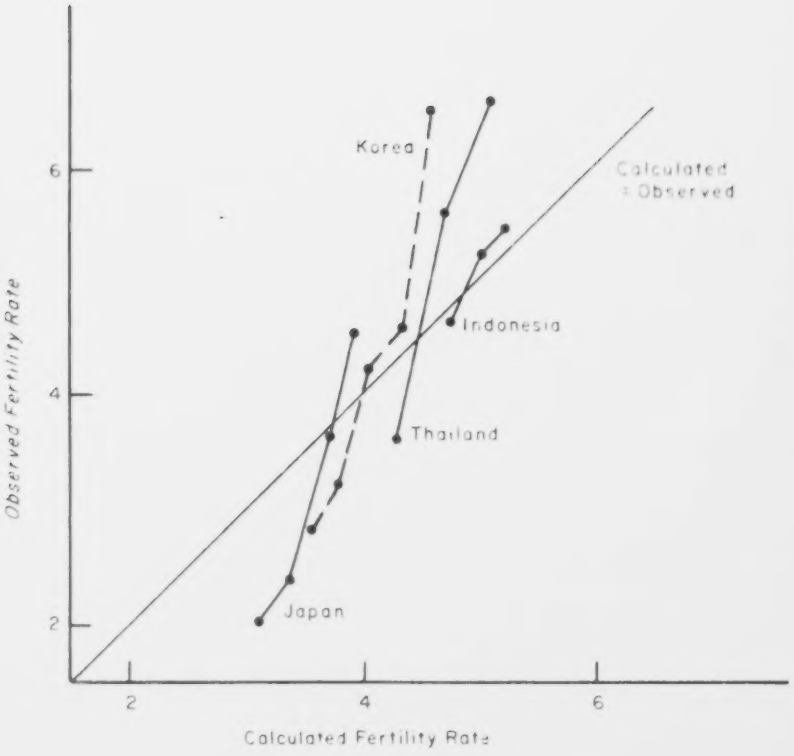


Figure 3

CROSS-SECTIONAL RELATIONSHIP OF FARM POPULATION TO GNP

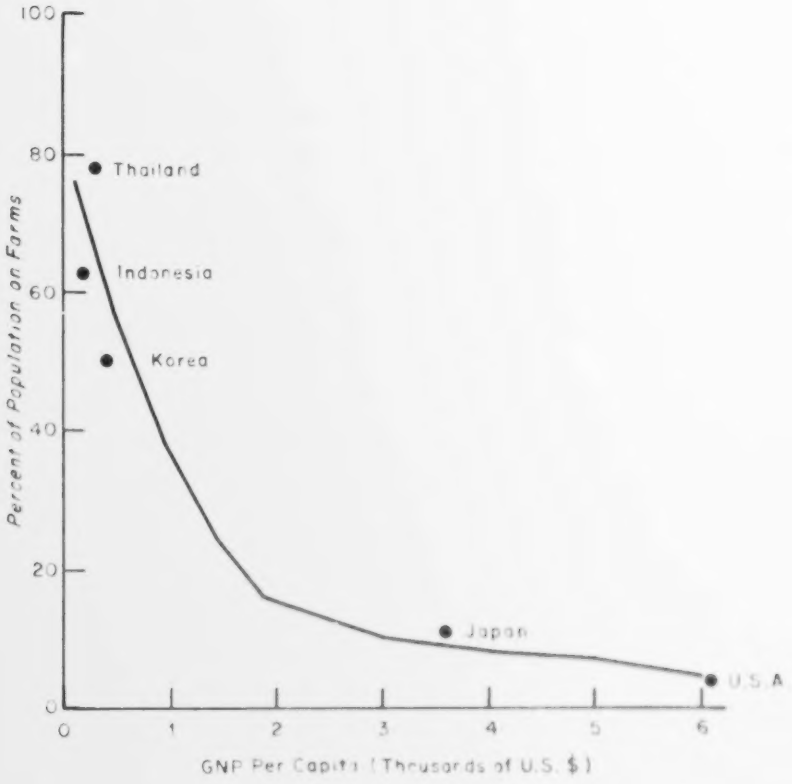
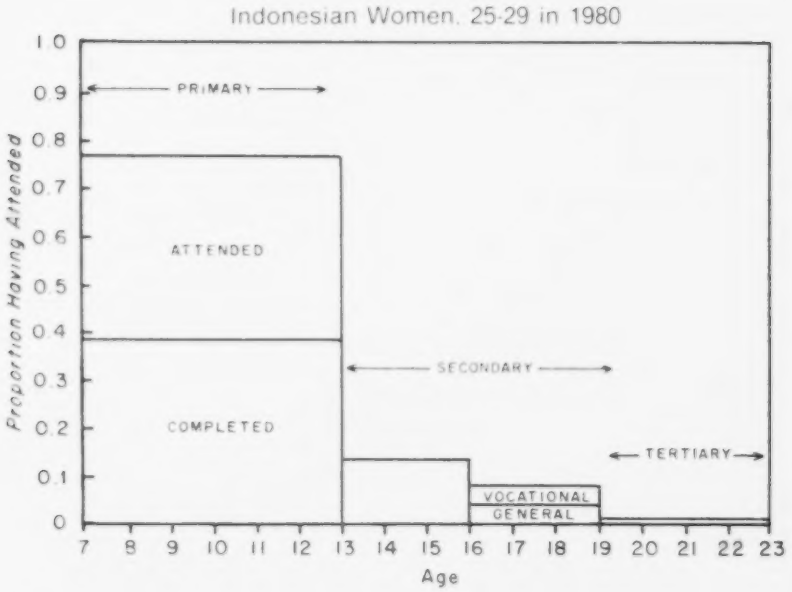


Figure 4

STRUCTURE OF THE SCHOOLING SYSTEM



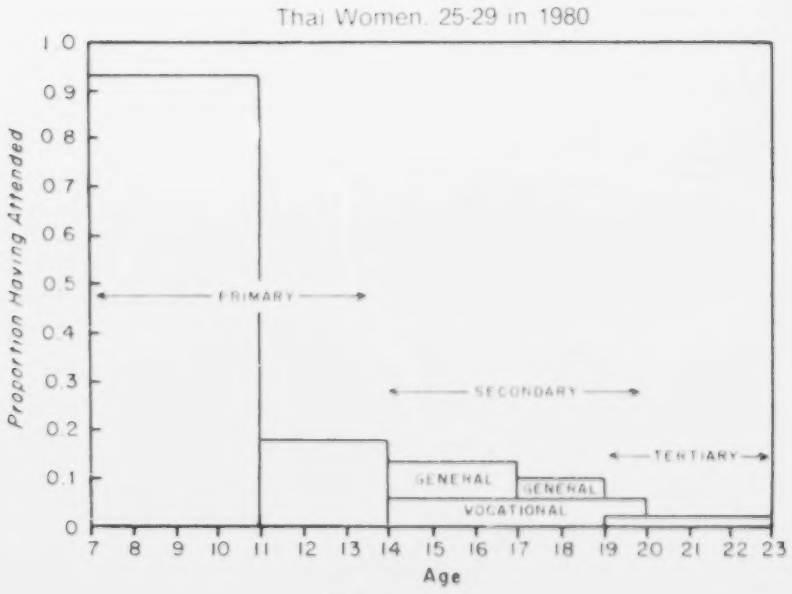
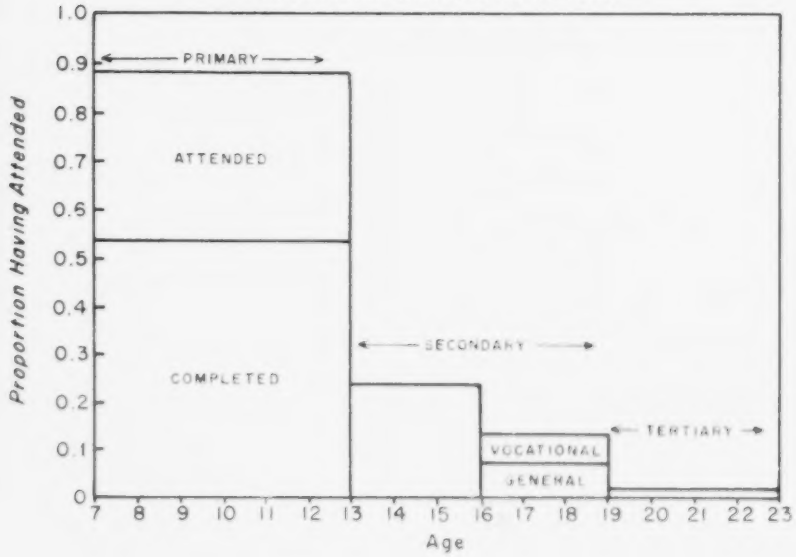


Figure 4

STRUCTURE OF THE SCHOOLING SYSTEM (continued)

Indonesian Men, 25-29 in 1980



Thai Men, 25-29 in 1980

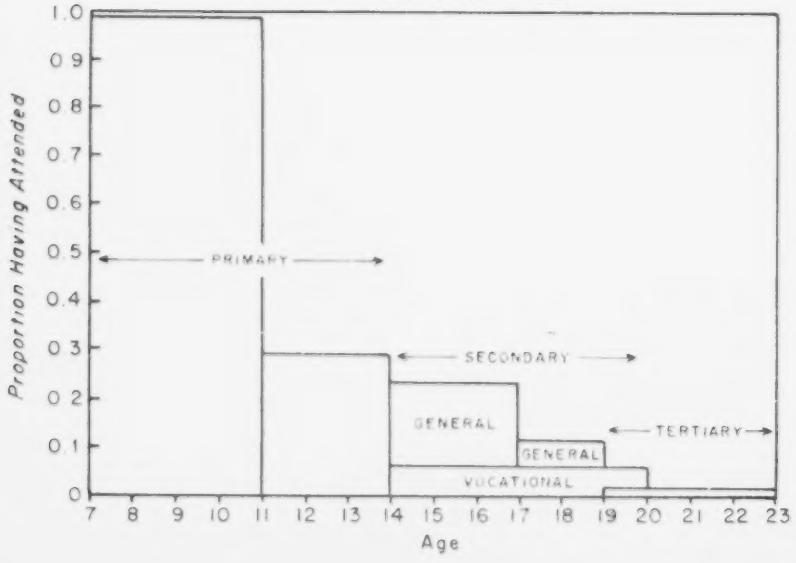


Figure 4

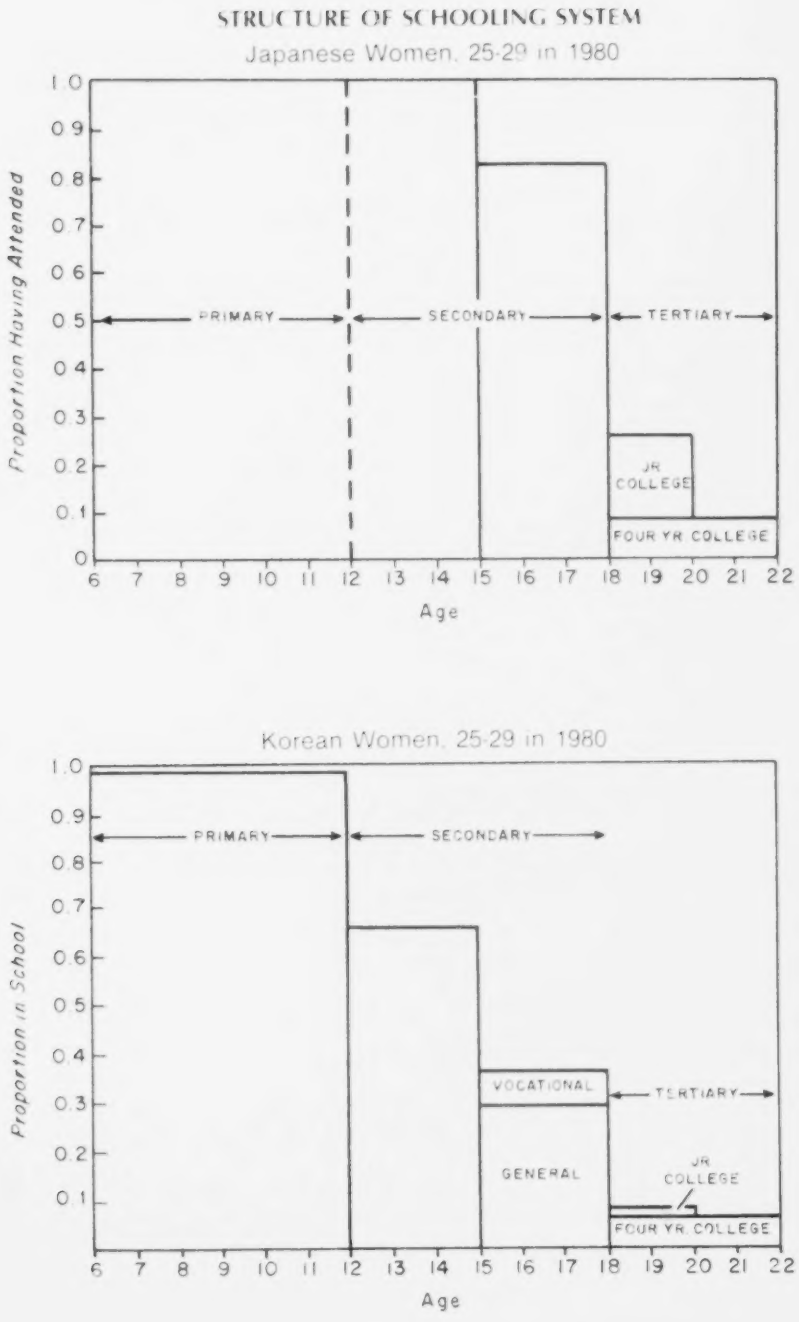
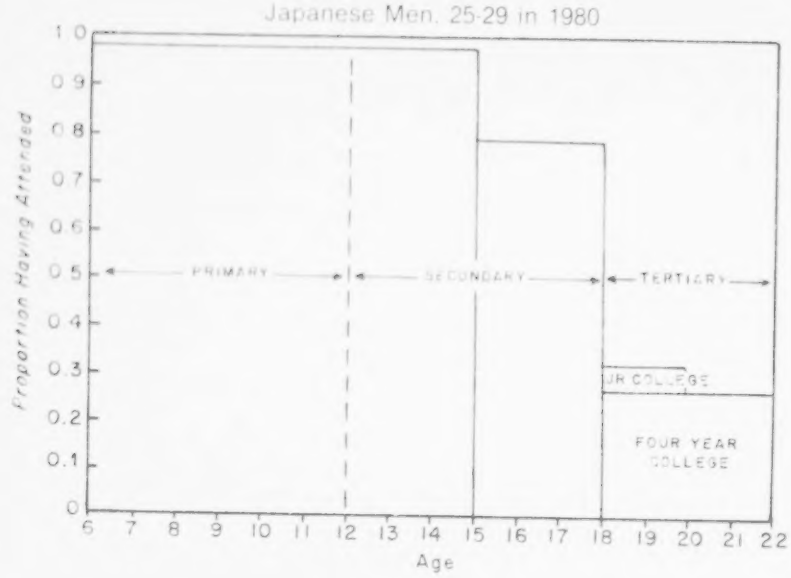

STRUCTURE OF SCHOOLING SYSTEM
Japanese Women, 25-29 in 1980
Proportion Having Attended
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
PRIMARY
SECONDARY
TERTIARY
JR COLLEGE
FOUR YR. COLLEGE
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Age
Korean Women, 25-29 in 1980
Proportion in School
PRIMARY
SECONDARY
VOCATIONAL
TERTIARY
GENERAL
JR COLLEGE
FOUR YR. COLLEGE
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Age

Figure 4

STRUCTURE OF SCHOOLING SYSTEM



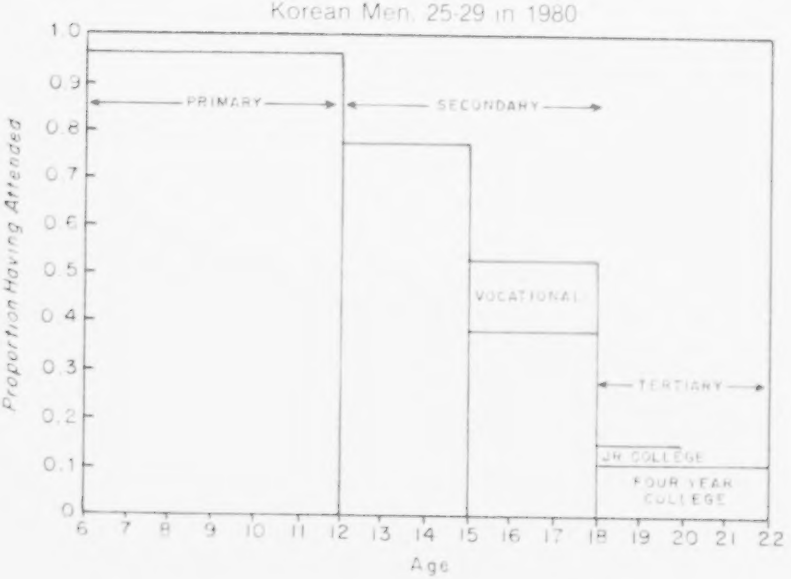


Figure 5

COMPARISON OF OBSERVED WITH CALCULATED SCHOOL ENROLMENT RATIOS

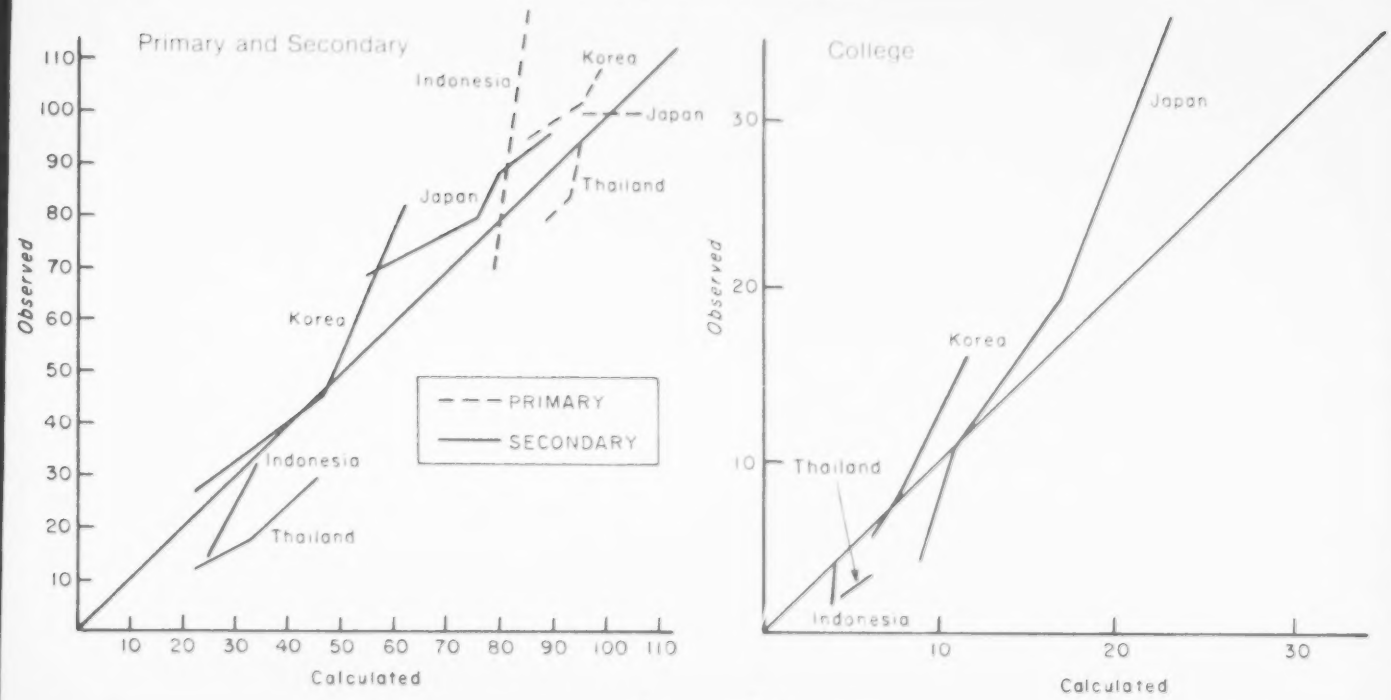


Figure 6

TOTAL AND URBAN POPULATION: STANDARD PROFILE VS. RAPID FERTILITY DECLINE

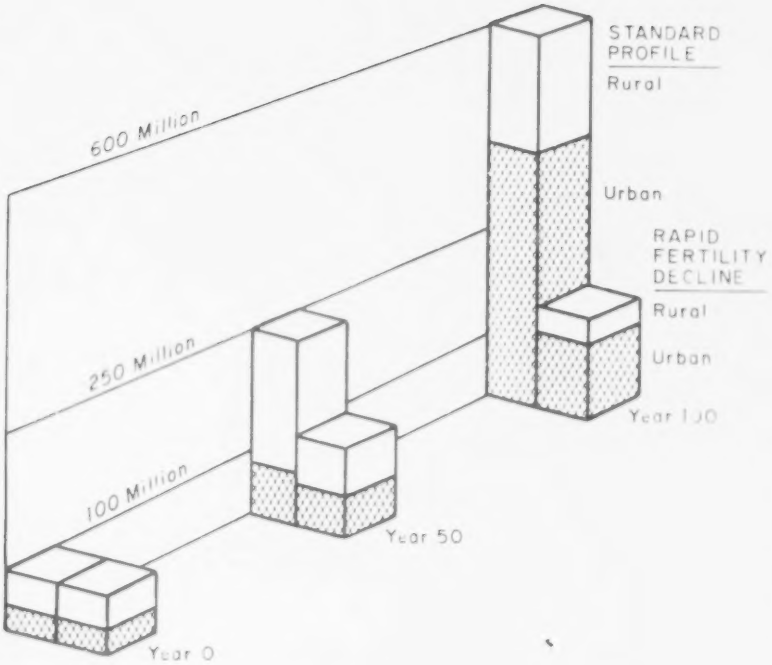


Figure 7

AGE PYRAMIDS: STANDARD PROFILE, RAPID FERTILITY DECLINE CASE AND KOREA

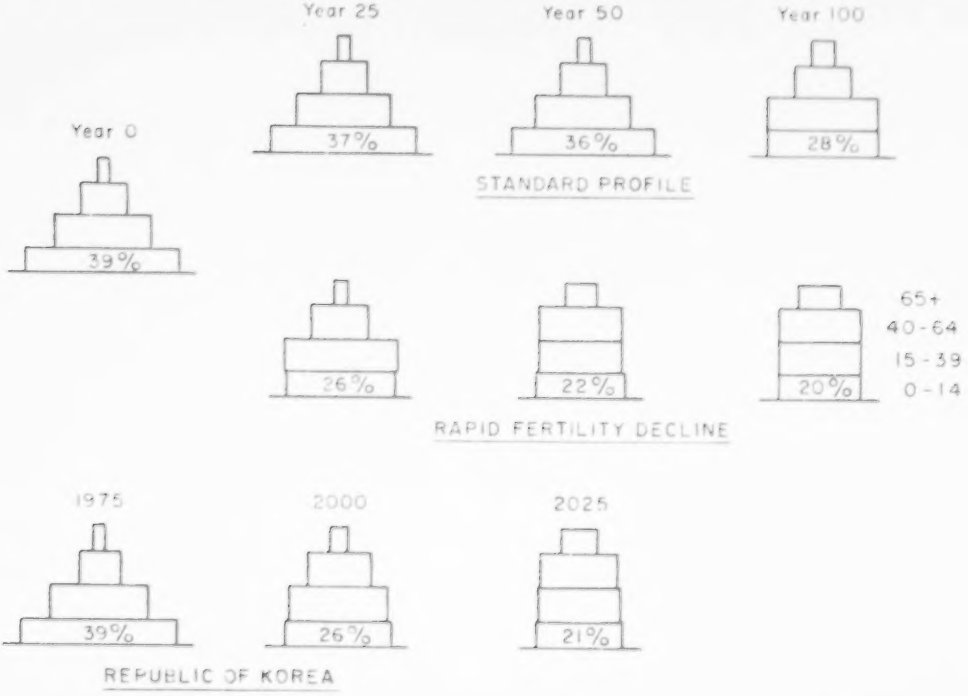
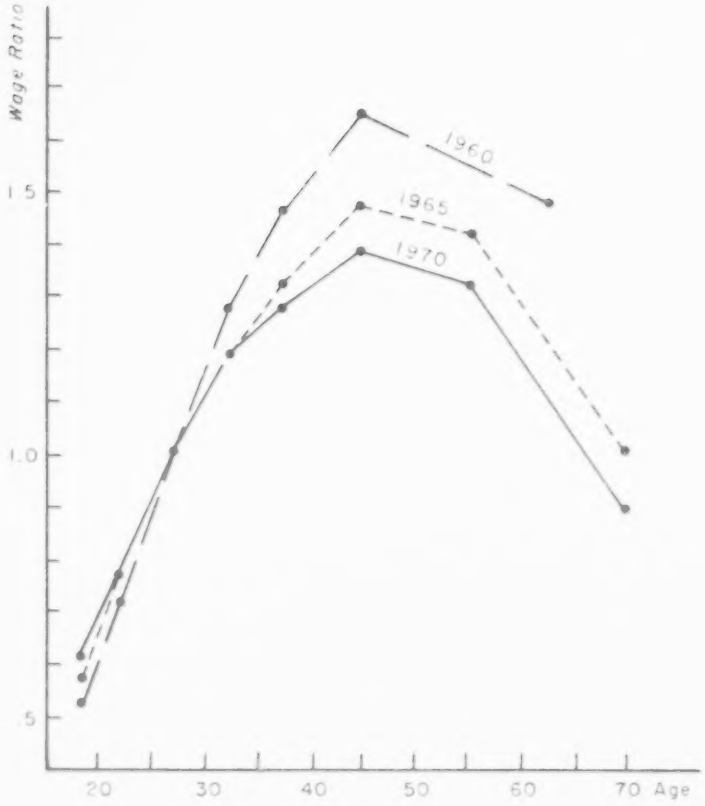


Figure 8

AGE-EARNING PROFILE FOR JAPAN



Source: L. G. Martin (1982)

Figure 9

ENROLMENT RATIOS: STANDARD PROFILE VS. RAPID FERTILITY DECLINE CASE

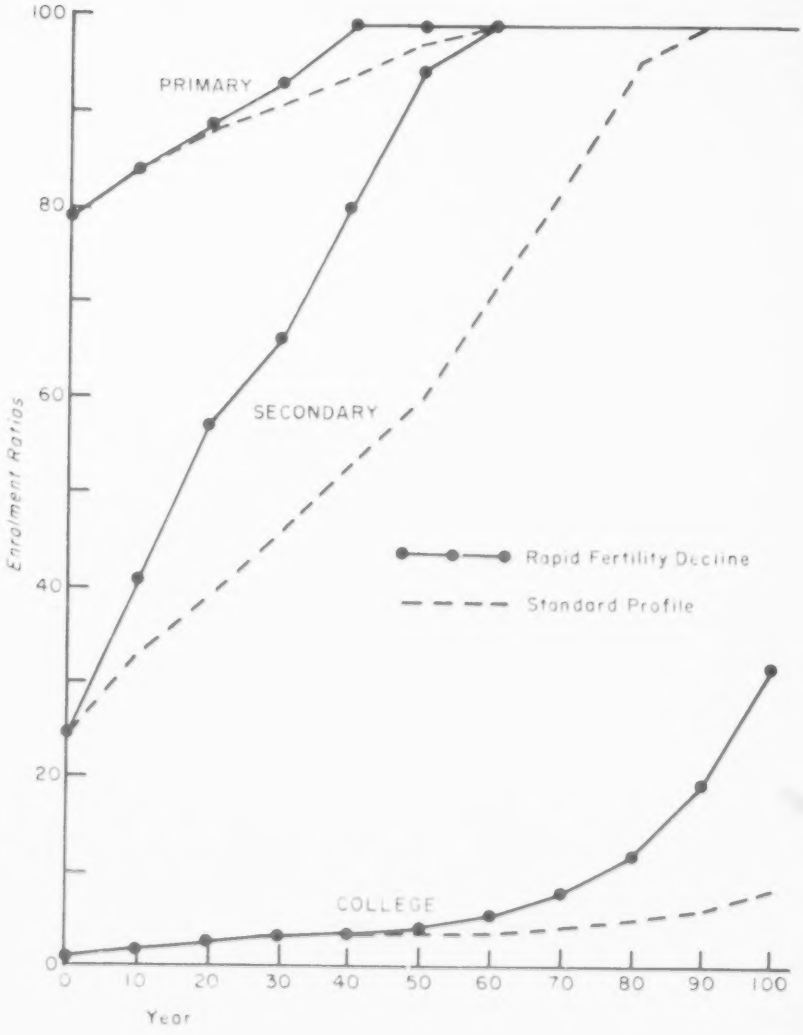


Figure 10

THE TRADEOFF BETWEEN SCHOOLING AND EMPLOYMENT:
15-19 YEAR OLDS, STANDARD PROFILE

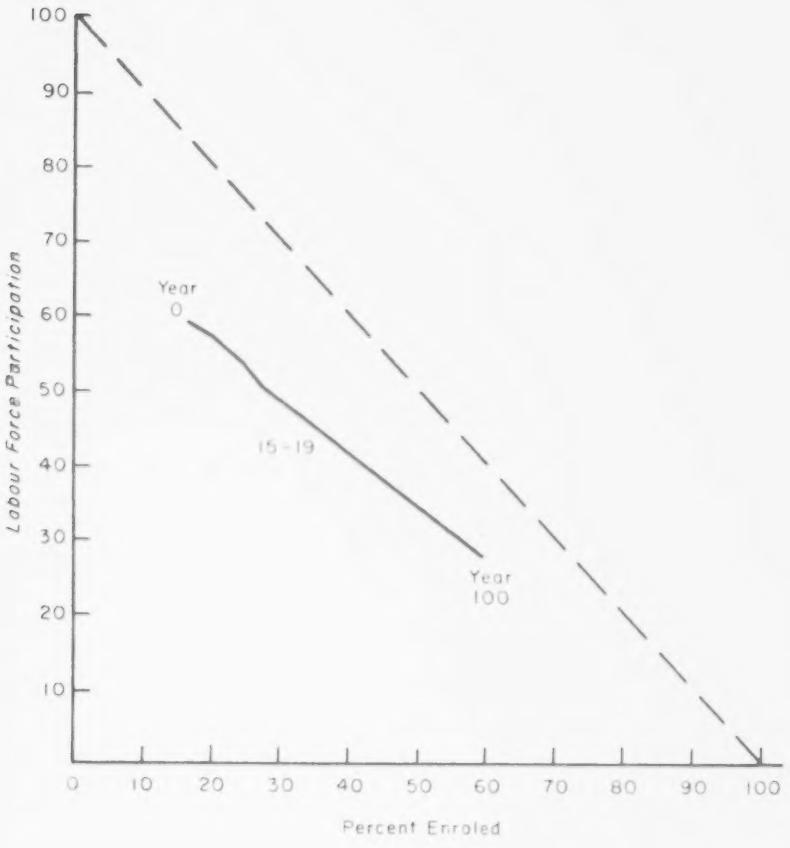


Figure 11

TRADEOFF BETWEEN SCHOOLING AND ENROLMENT MALES 10-14, 15-19, and 20-24 YEARS OLD IN INDONESIA 1971-1976, JAPAN 1960-1980, KOREA 1960-1980, AND THAILAND 1960-1980

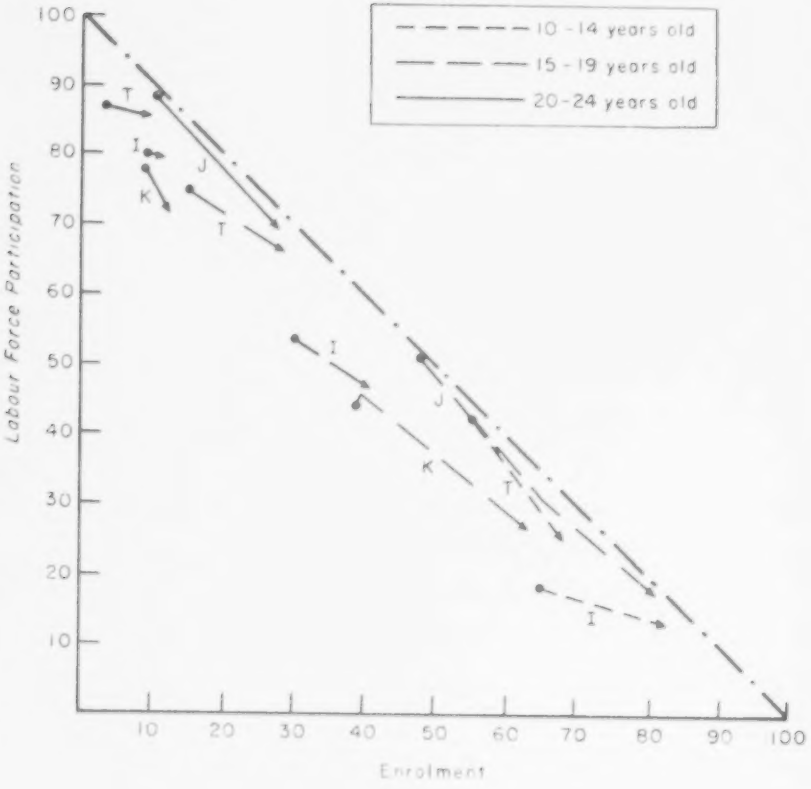


Figure 12

TRADEOFF BETWEEN SCHOOLING AND ENROLMENT
FEMALES 10-14, 15-19, and 20-24 YEARS OLD IN INDONESIA
1971-1976, JAPAN 1960-1980, KOREA 1960-1980, AND THAILAND
1960-1980

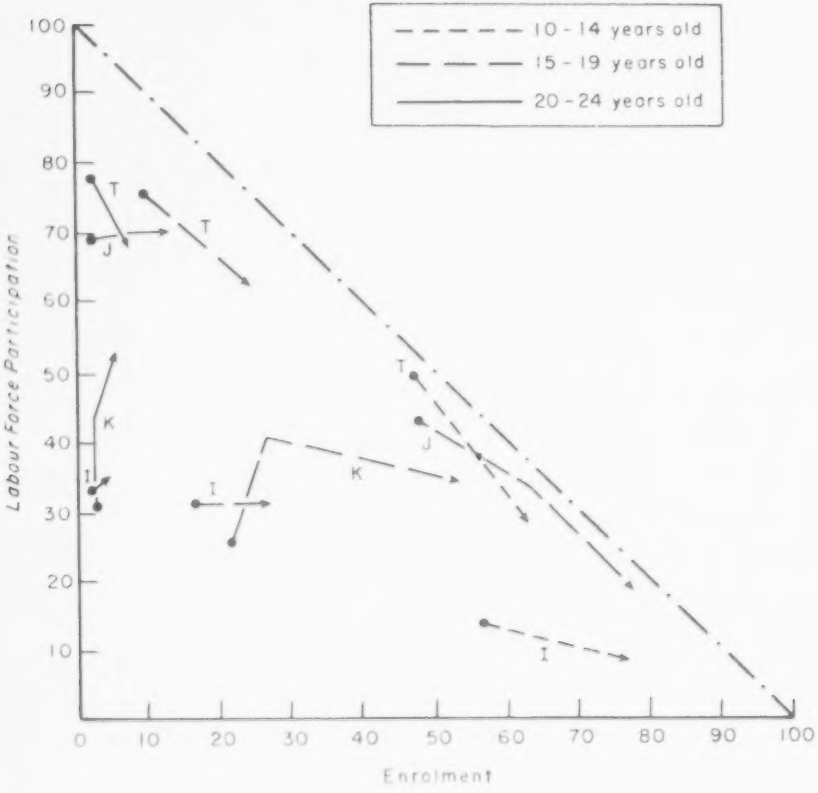


Figure 13

AVERAGE MONTHLY WAGES BY EDUCATION AND AGE
Korea, 1980 (thousand of won)

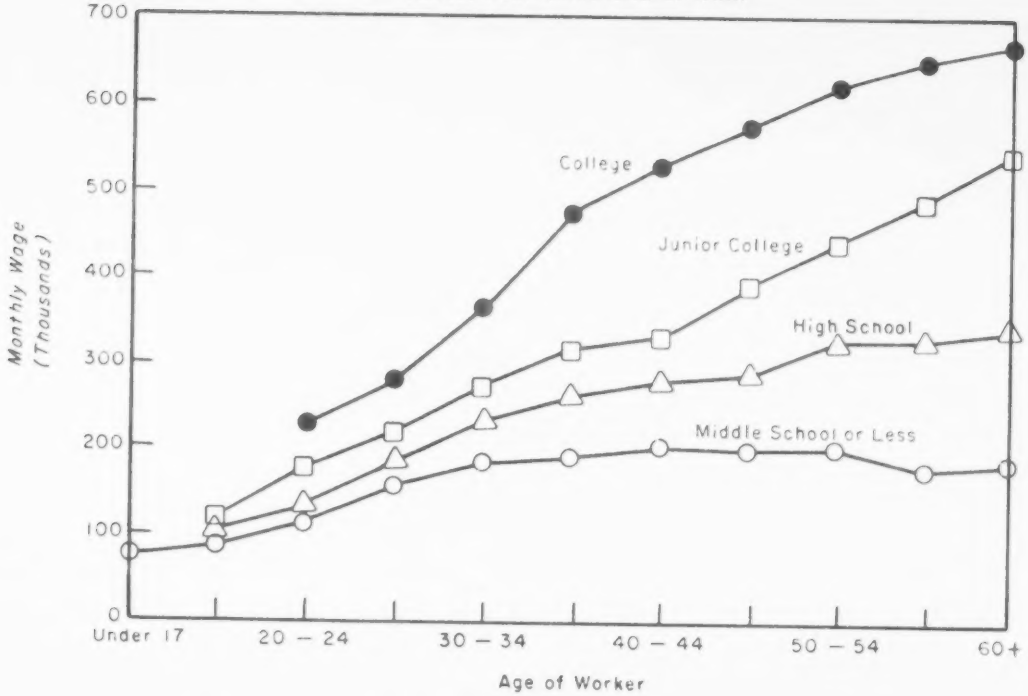


Figure 14

NUMBER OF WORKERS AND EFFECTIVE WORKERS PER PERSON:
STANDARD PROFILE VS. RAPID FERTILITY DECLINE

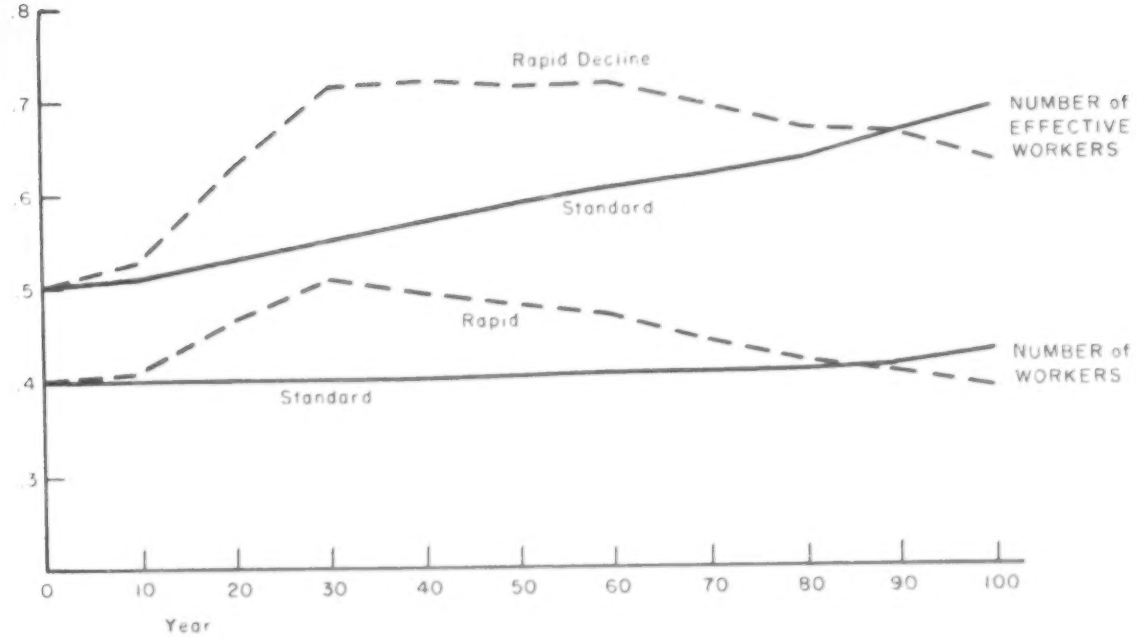


Figure 15

COMPARISON OF SAVING IN FOUR ASIAN COUNTRIES WITH STANDARD PROFILE

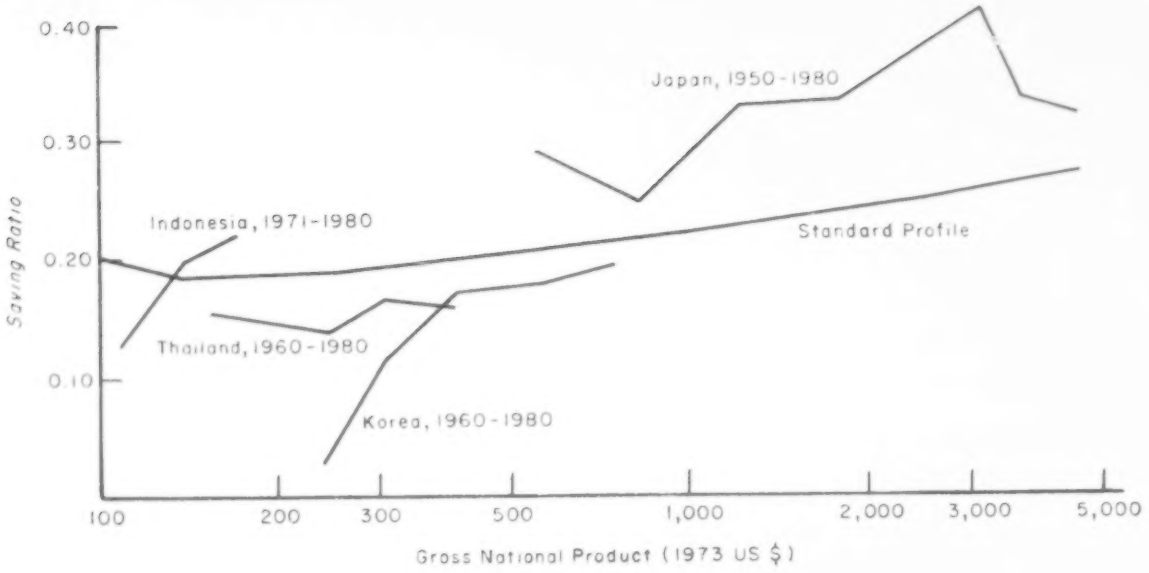


Figure 16

GROWTH IN GNP/Per Capita: STANDARD PROFILE VS. RAPID FERTILITY DECLINE.

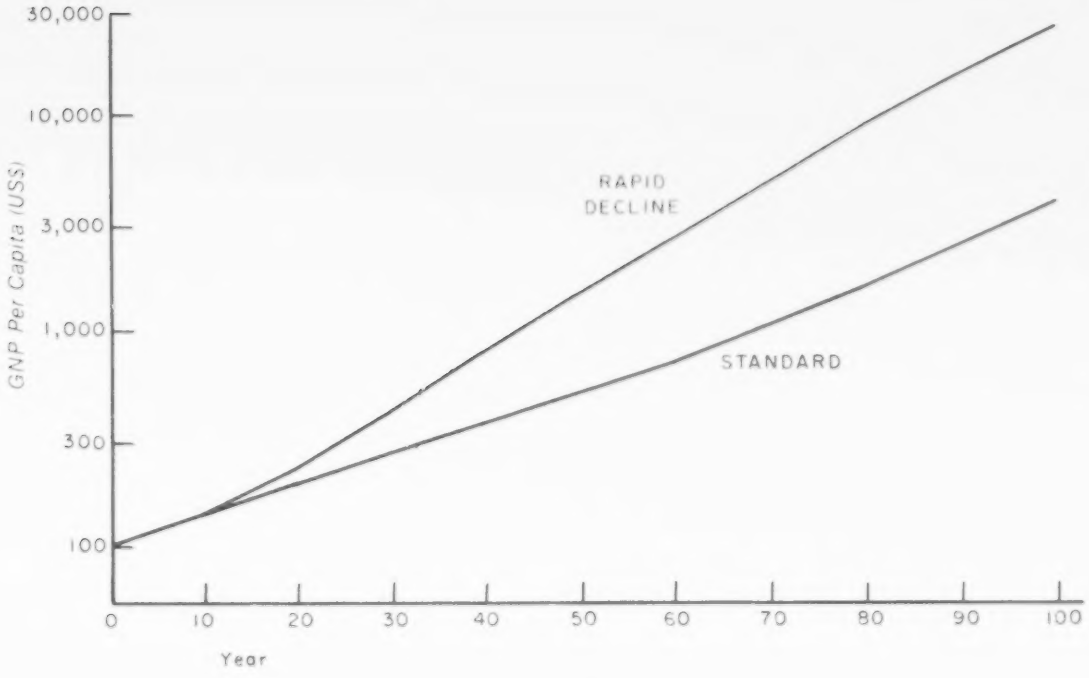
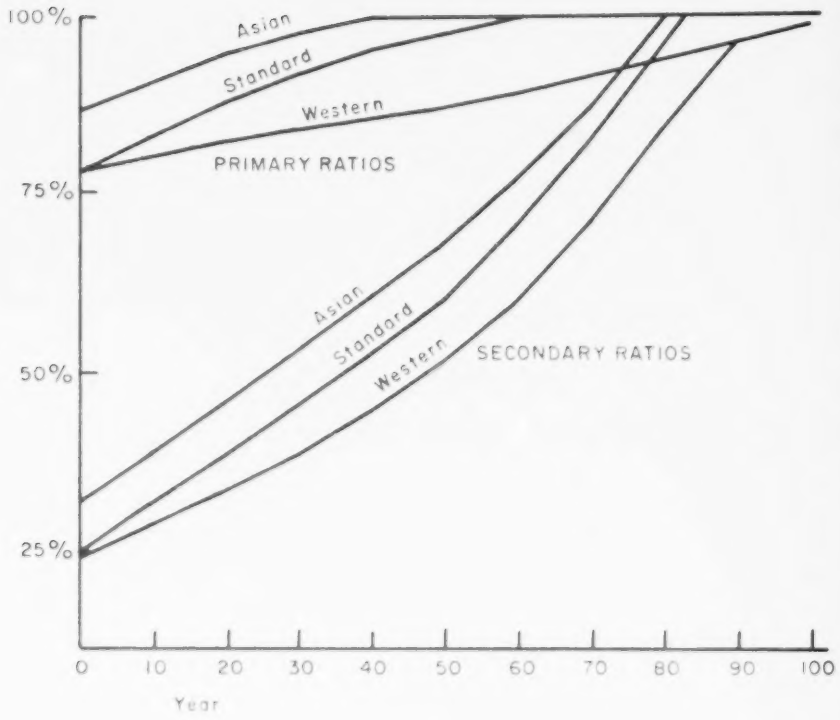


Figure 17

ENROLMENT RATIOS AND EDUCATIONAL ATTAINMENT
A. PRIMARY AND SECONDARY ENROLMENT RATIOS



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United Nations Fund for Population Activities
220 East 42nd St., New York, N.Y. 10017